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Plans

The Woodcarvers of Songimvelo

Popular Woodworking

Issue #80 September 1994

Super Projects

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Rocking Horse

Deck Furniture

Revolving Bookcase

and more

Win a Drill Press

(see page 89)



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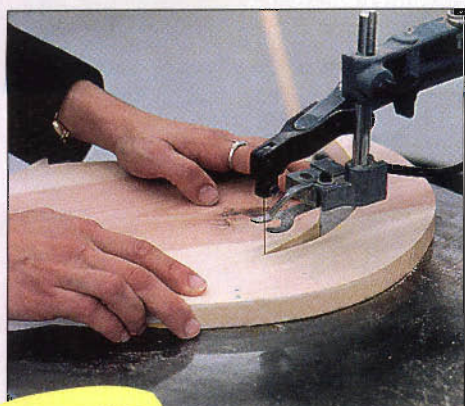
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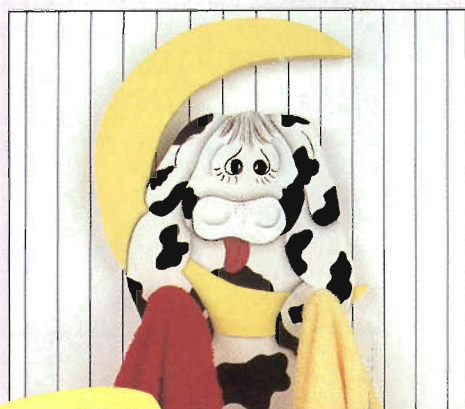
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Cut It



Paint it



Show it

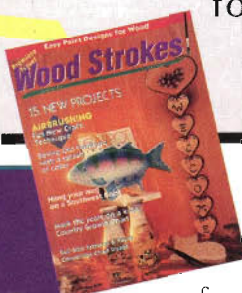


Wood Strokes Magazine

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We Have It All!*

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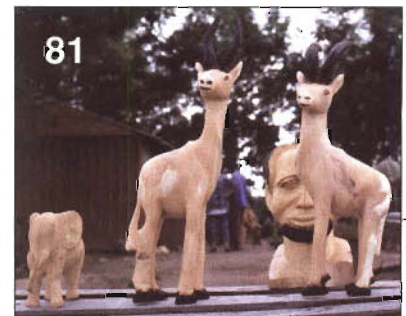
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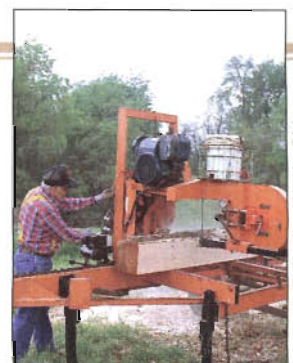
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On the Cover

Joseph A. Vano turns trees into lumber. Most of us are familiar with the varied aspects of woodworking, but know little about how trees get turned into the boards we purchase at our local lumber yards. Mr. Vano, a member of Woodworkers of Central Ohio, has given several demonstrations to his club. Because of the numerous questions he's asked, he thought the subject would be of interest to other woodworkers. For the full story see "The Tool Wright's Corner" on page 72.



Cover: J&B Studio, Heath, Ohio

A Master Craftsman Project—**PullOut™ Plans****Hope Chest®** by Ken Sadler 27

A Popular Woodworking Project

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A Popular Woodworking Project

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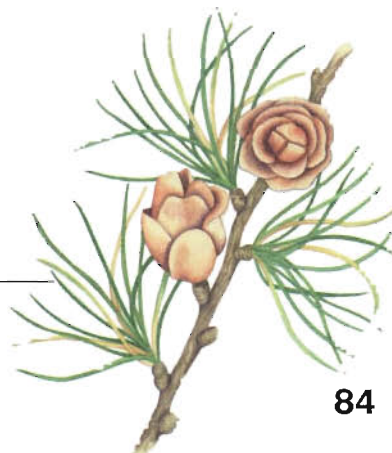
An Article of Interest by Carolee Boyles-Sprenkel

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Popular Woodworking goes on-line with CompuServe® Information Service

Sometimes it's frustrating trying to find the time to answer your letters and phone calls while in the midst of building a project or getting the magazine ready for the printer. I know that when you have a problem that's stopped your progress or you're searching for a part, waiting on the mail can be nerve racking—you need the answer when the question arises, not two weeks later.

Contributing Editor Ken Sadler convinced me that I should check out the Woodworking Section in the Crafts Forum on CompuServe. The Crafts Forum has many sections for the enthusiast to network with others of similar interest. One of them covers woodworking. I've been on the service for the last month and the experience has been both rewarding and interesting.

The first time into the forum, you just log in and introduce yourself. The computer remembers you from then on. There's a constant dialog of questions and answers on all manner of woodworking subjects.

Many of the forum members have decades of woodworking experience in almost every field—from construction to the preservation of our nation's heirlooms—and are willing to jump in and offer help on any level. More than likely, you'll receive several different, but workable, solutions to your questions. And who knows,

maybe you'll be able to offer someone a solution to a problem you've experienced in the past.

For example, one forum member was looking for information on radial drill presses. He wanted to buy one and had narrowed it down to two choices. I was in the midst of preparing this issue's *Tool Talk* (page 78) dealing with the same subject so I downloaded the text to the forum. I received several messages thanking *PW* for making the information available before publication.

All of the discussions I've followed since logging on have been very polite—people are quite civil in this electronic world. But that doesn't mean some of the subjects and ensuing discussions aren't "hot." There's been a raging debate on OSHA rules dealing with safety equipment on power tools. As you can guess, there are two highly opinionated and emotional camps on this subject.

The debate went on for days—*ad nauseam*—yet everyone remained polite. A lot of positive points were expressed on both sides of the argument, and some foolishness. I've asked R.J. De Cristoforo to take up the subject in an upcoming *Cris Cuts*. He's had years of experience in this field.

CompuServe also offers E-Mail. E-Mail is private, one-on-one correspondence and is not open to the general forum. You can answer the

sender of a public statement privately or you can answer a private question publicly.

So, how do you get a hold of us? My CompuServe address is: Rob Cook 75310,1246 and you can leave messages, queries for articles or just general banter either in my E-Mail or in the Woodworking Section of the Crafts Forum. If you'd like to get a hold of Ken Sadler with questions on any of his *Master Craftsman* projects or *The Business End*, his address is: Ken Sadler 76334,735.

We are also considering using other on-line services for those of you not connected to CompuServe. If you're interested, you'll have to let me know through the ol' pony express.

A couple of the other woodworking magazines are also on-line.

South African Woodcarvers

Carolee Boyles-Sprenkel traveled to South Africa last year and sent us a wonderful article on the "Woodcarvers of Songimvelo." It begins on page 81. Songimvelo translates to "preserve the land." She plans on returning to South Africa and would be interested in having other woodworkers accompany her on a tour of discovery. By the way, her CompuServe address is: Carolee Boyles-Sprenkel 71610,475.



Safety Note

Safety is your responsibility. The manufacturers place safety devices on their equipment for a reason. In most of the photos you see in *PW*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Please don't copy us. Think about each procedure you're going to perform beforehand. Think ahead.

Letters

We welcome your comments, pro or con, about articles we publish. We also want to see color pictures of what you're building. Send your letters and photos to: Editor, *Popular Woodworking*, 1041 Shary Circle, Concord, CA 94518. Letters may be edited for publication.

Delta Shaper Parts

I'm looking for a spindle for my Delta shaper, model 43-110, that will accept $\frac{1}{2}$ " shank router bits. I have the 43-185 spindle for $\frac{1}{4}$ " bits. Delta International's catalog indicates they make both spindle accessories for the 43-122 and 43-140 shapers, but mine's not listed. I contacted Delta's parts department, but they say they no longer have the spindle I'm looking for. Any help in locating this accessory would be greatly appreciated.

John Brown
Phoenix, Arizona

Nautical Flower Box Errors

We received a few letters pointing out that the PullOut™ Plans for this project in the May, 1994 issue contained errors. If you would like a corrected drawing drop us a note at 1041 Shary Circle, Concord, CA 94518, and we'll be glad send you one.

There were also a few complaints that the drawings weren't "Full-Size" as advertised on the cover. Ninety-nine percent of our plans are full-size, but occasionally a project that we know you'll like won't fit in the space allowed. So we have a choice: shrink it or forget it. The corrected plans are also $\frac{1}{2}$ " = 1".
the Editors



Central Machinery Parts

In response to James Martin's plea for parts in the May, '94 issue, Central Machinery is still making 14" band saws. Harbor Freight, 3481 Mission Oaks Blvd., Camarillo, CA 93011 has a wide range of Central Machinery tools. Their toll-free number is 800-423-2567.

Jim MacFarland
Mauston, Wisconsin



Air Mail

I had just finished building a hanger for my airplane and I got the idea to make a mailbox that would resemble my airplane. No one else at the airport has a mailbox just like mine. The total cost, with a new mailbox, runs about \$25. You can buy them, representing all types of sports and hobbies, from \$75 to \$125, but they're not personal.

Don Sektnan
Eagan, Minnesota

More Mighty Mites

(left) The excavator was painted according to my grandson's specifications. He loves looking through your magazine for pictures of other toys so he can get me to build them for him.

Leonard Hatteberg
Silverton, Oregon

(right) I made the Mighty Mite for my grandson, Kevin, out of maple. It was nose heavy and fell over, so I added an official counter balance to the back of the seat.

Dick Proschold
Foresthill, California

Watch Those Lines

This is in response to "Get Those Lines Straight" in the July PW *Out of the Woodwork*. Dorothea, I'd take a power miter or a biscuit cutter over Tupperware any day of the week. But then, maybe I'm not a stereotypical female.

Rose Rawson
Houston, Texas



Heirloom from Scrapwood

I had to write and tell you how much I enjoyed Robert Elmore's rocking horse (Nov. '93). Rather than use $\frac{3}{4}$ " pine or oak, I chose hardwood mill end scraps from the local cabinet shops throw-away bins. I glued the various sized pieces of mixed woods together and planed the panels to $1\frac{1}{8}$ ".

As a hobby, woodworking has such meaning and is a great stress reliever.

The rocking horse hasn't been field-tested as yet. My son and daughter are bringing the grandchildren for a visit over the next couple of months. I think this grandmother of six will have a lot of fun watching the grandchildren play with this new addition to our household.

Karen Buesing
Los Gatos, California



Tricks of the Trade

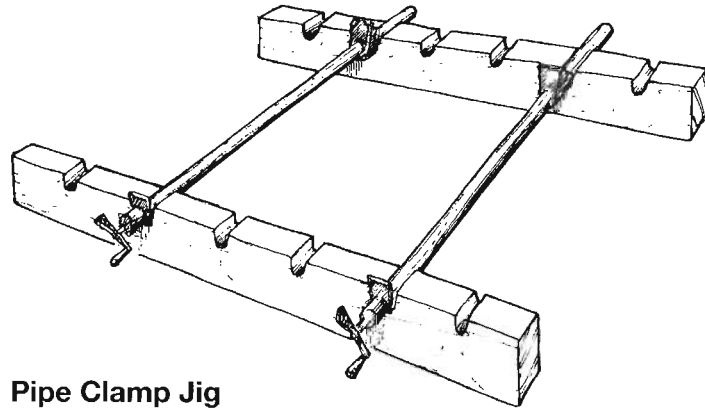
Tricks of the Trade shares readers tips for making woodworking tasks easier and safer. Send your original, unpublished ideas to Tricks of the Trade, % Popular Woodworking, 1041 Shary Circle, Concord, CA 94518. We pay \$35 for each TOT we publish.

Mini Spring Clamps

Recently my wife disposed of an unwanted skirt hanger. Upon inspection I saw the potential for recycling the spring clips on the hanger which hold the skirt.

I removed them from the steel rod then reassembled the clips into two separate miniature spring clamps. I inserted a 10d common nail through the holes in the two sides and center of the spring. I used the head of the nail as a stop on one side and cut off the point so $\frac{1}{8}$ " protruded. I peened over the cut off end of the nail to secure the pieces together. This small clamp comes in handy for many smaller projects. It has a jaw opening of $\frac{3}{4}$ " and the jaws have small rubber inserts which provide a non-slip grip.

Kris R. Hoover
Phoenix, Arizona



Pipe Clamp Jig

When edge gluing boards to width, pipe clamps can often become unruly. It is awkward to tighten the clamps when they're placed on the floor. To remedy this problem I built this simple jig.

Using two 48" long 2 X 4's, strike a line on the side of each board, $\frac{1}{16}$ " from the edge. Make a cross mark along the lines every 6". With a 1" spade or Forstner bit, drill out seven holes in each 2 X 4 using the cross marks as centers. Mark two tangent lines from the edge of the 2 X 4 to the sides of the holes. Use a saber saw to cut out the tangent lines. With a file or sand paper, smooth out any ragged splinters. Put the jig on the table or floor, line up the pipes in the slots and your ready for a much easier gluing process.

Sidney R. Watts
Kaysville, Utah

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Binders

1041 Shary Circle, Concord, CA 94518

Plastic Drinking Straws Come in Handy

When passing doorbell wire through studs, it's necessary to drill the smallest hole possible in order to maintain their structural integrity. The wires tend to hang up on the rough insides of holes. To make this task easier, drill your holes large enough to accept the outer diameter of a plastic drinking straw, push the straw through and clip it flush. Guide the wire through the straw. The wires won't hang up, and the holes are small enough to retain the integrity of the stud.

Lane Olinghouse
Everett, Washington

Storing Patterns

I discovered a unique and practical method for storing my patterns and templates. Rolls of shelf paper are perfectly suited to this purpose. Unlike acetate or plywood templates, paper patterns can be rolled up or folded for easy storage.

I trace or tape the patterns on the grided side of the paper. Information about the pattern can be written on the paper including paint colors, stains, wood size, source of the pattern, page numbers, etc. The grids on the paper allow for easy resizing of the patterns. These templates can be used for future reference and as tracing templates.

Lisa Fontaine
Concord, California

MLCS

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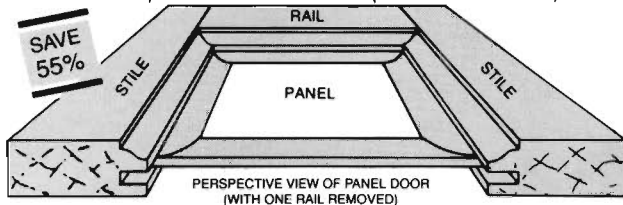
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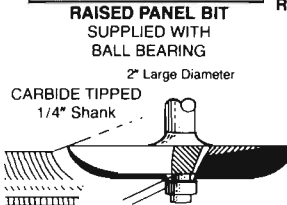
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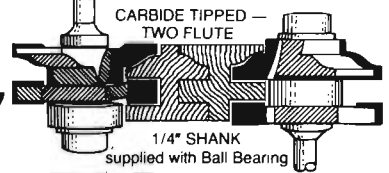


PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)



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#1308	CLASSICAL - 3/16" Radius — 5/8" Cutting Length	1/2"	\$22.50		#1339	FLUSH TRIM - 1/2" Diameter — 1-3/16" Cut. Length	1/2"	\$ 8.00
#1309	45° CHAMFER - 3/8" Cutting Length	1/4"	\$13.00		#1340	PATTERN / FLUSH TRIM - 1/2" Diameter	1/4"	\$15.00
#1310	45° CHAMFER - 5/8" Cutting Length NEW !	1/4"	\$15.00		#1341	PATTERN / FLUSH TRIM - 3/4" Diameter NEW !	1/4"	\$17.00
#1311	45° CHAMFER - 5/8" Cutting Length	1/2"	\$17.00		#1342	PATTERN / FLUSH TRIM - 3/4" Diameter	1/2"	\$19.00
#1312	THUMBNAIL - 1- 3/16" Large Diameter	1/4"	\$18.50		#1343	KEYHOLE CUTTER - 3/8" (bit not shown)	1/4"	\$ 8.50
#1313	THUMBNAIL - 2-1/2" Large Diameter	1/2"	\$35.00		#1344	KEYHOLE CUTTER - 1/2" shown	1/4"	\$ 9.00
#1314	ROUND OVER - 1/8" Radius	1/4"	\$11.00		#1345	DOVETAIL (HSS) - 1/4" Diameter — 7-1/2"	1/4"	\$ 6.50
#1315	ROUND OVER - 3/16" Radius	1/4"	\$11.00		#1346	DOVETAIL - 1/2" Diameter — 14° NEW !	1/4"	\$ 6.00
#1316	ROUND OVER - 5/16" Radius	1/4"	\$14.00		#1347	DOVETAIL - 1/2" Diameter — 14°	1/2"	\$ 6.50
#1317	ROUND OVER - 1/4" Radius NEW !	1/2"	\$12.00		#1348	BEADING - 1/4" Radius	1/4"	\$13.00
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#1325	RABBETING - 3/8" Deep	1/4"	\$13.00		#1356	EDGE BEADING - 5/16" Diameter of Circle	1/4"	\$15.50
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#1331	BULL NOSE - 3/4" Diameter of Circle	1/4"	\$21.00					
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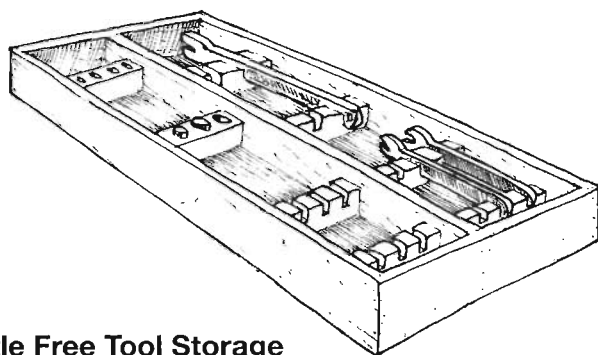


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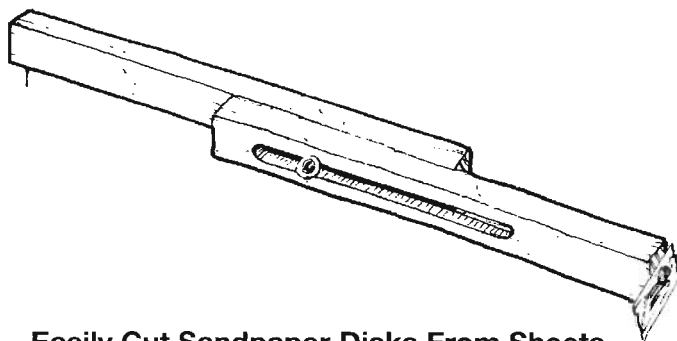
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Rattle Free Tool Storage

Some time ago I devised a way to divide the wrenches and sockets in my tool box tote-tray. On long trips the motion and vibration caused noticeable marring and damage to the tools as they would rub together. Also, the noise created was nothing less than irritating. My solution is to take a white nylon cutting board and cut it into strips to be used as dividers so the wrenches fit snugly side by side; one set of notches in two parallel strips for each wrench. For the sockets I drilled the appropriate size holes. Nylon is easily worked and the idea can be enlisted for many circumstances where it is necessary to keep things from bumping together.

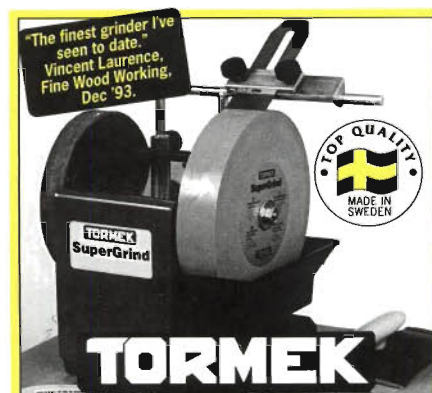
Robert Hirsch
Apple Valley, Minnesota



Easily Cut Sandpaper Disks From Sheets

I have found that sandpaper disks are easily and accurately cut from standard size sheets with the aid of this little cutter. Two strips of wood, a single edge razor blade, a finishing nail and two small wood screws are all that's needed. Cut a long slot in one of the two pieces of wood to a width that will allow it to slide over one of the wood screws. Secure the two strips with a wood screw and drive the finish nail in one end of the stick that doesn't have the slot cut in it. Now, fasten a razor blade on the end of the second stick using the other wood screw. The two strips can be adjusted for cutting one or more sheets at a time.

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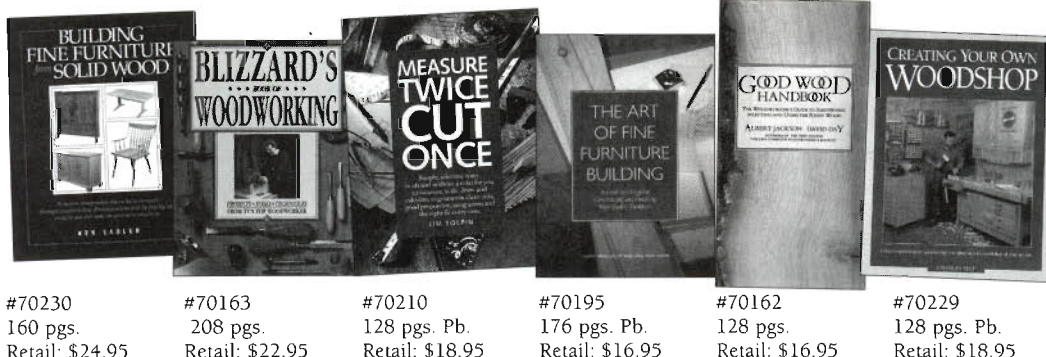
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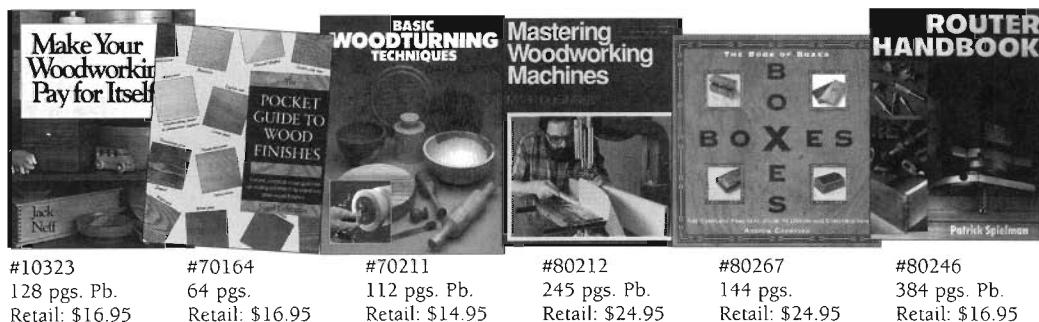
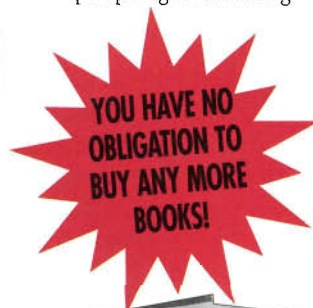


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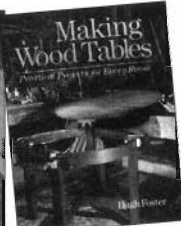
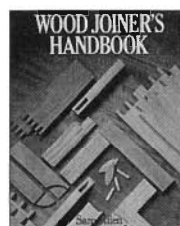
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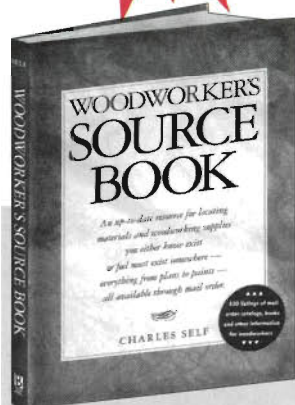
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The Best Books to Learn By

A reader wrote asking whether *The Encyclopedia of Woodworking Techniques* by Jeremy Brown would be a good beginning book for a person with minimal woodworking experience. If not, would I recommend one. Here are several:

The Encyclopedia of Woodworking Techniques is a dandy, but if I could only have one book to get started, it would be Tage Frid's "new" book from Taunton Press.

Years ago, I bought *Tage Frid Teaches Woodworking* in three hardcover volumes, and all three were old news when I used them as the subject of my first book review column ten years ago. Now Taunton has reissued the first two volumes in a single paperback (468 pages, 1565 photos, 480 drawings, \$29.95, 800-888-8286). The volumes are subtitled: "Book 1: Joinery," "Book 2: Shaping, Veneering, Finishing." I have yet to see any book that covers this material better.

A jigmaker extraordinaire, Frid has done more than any other woodworker I know to make crafting fine furniture practical, safe and reasonably expedient. When I want to read about attitude and art, I'll pick up Krenov. When I want to know HOW, I go to Frid.

The Frid books live in my shop, not in my book case. That's because his books present clear how-to-cut and why-to-cut all the major woodworking joints step-by-step. He shows how to cut them using hand or power equipment, and he shows how to cut them safely. This reprint would be my first choice.

My second choice, for pure inspiration is the Krenov trilogy, *A Cabinetmaker's Notebook*, *The Impractical Cabinetmaker*, and *The Fine Art of Cabinetmaking*, now available as reprints from Sterling. There's not much directly

about technique in these volumes, but Krenov does cover a great deal of technique in his rhapsodic prose about attitude. Hindsight suggests that I learned to woodwork fifty per cent from Frid's book and thirty-five per cent from trial and error. But I wouldn't have learned anything had it not been for Krenov. He made me want to build, and he convinced me that desire is the better part of any quest.

The projects he illustrated his books with are so gorgeous! The Sterling reprints are almost prettier than the original volumes; the quality of the photo reproductions is higher, and Sterling added a few pages of color photos of the projects. I reread these volumes at least annually—just for inspiration.

My third recommendation is Thos. Moser's inexpensive volume *Building Shaker Furniture*; half the book is a collection of designs (very good designs for my money), and the other half is as clear and brief an introduction to woodworking as you could want!

I love these books. If you buy each of the volumes I suggest, you'll spend about \$200. Large city libraries have an excellent collection and you can easily see these books before you buy them. Where I live, I had to buy them on faith. As you're looking, you'll probably add other titles to the list; it's not hard at all to build a pretty large woodworking library.

Don't spend all your time reading about it. After all, woodworking is something to do, not just to read about. Indeed, *doing* is the real trick to learning woodworking. If you're a good reader, these books will put everything you need to know into your head, but having it in your head just isn't enough. Somehow you've got to get it into your muscular memory, and the only way to do that is to build some projects. Of course, some of the early projects will be embarrassing—that's how we learn, and that's what fire places are for! Error is part of the cost of learning. **PW**

Hugh Foster is an English-teaching woodworker and author from Manitowoc, Wisconsin, and frequently contributes to *Popular Woodworking*.

The Woodworkers' Alphabet—"A"

Circle the words—they're horizontal, vertical and diagonal. The solution is on page 89

R X I F E T N A A U Z
O A R A F A D M S O P
T P W Y X H K O P H S
A L J A E E N L E A A
R S O S U L A T N R C
E Q I A S G D P R M L
L V T P A N E I E A I
E U A R U A S R P D V
C P T O U D U P L I C
C S A N J Z L A C O R
A N N U L E T G Y K B

Accelerator—hardener for polyester lacquer
Adhesive—used to bond pieces together
Adze—axe with a curved blade fixed at a right angle to the handle
Angle—meeting of two lines
Annulet—small moulding around a Doric capital
Antefix—ornamental corner on furniture
Apple—hardwood
Apron—wide board under the top edge of a table
Armadio—large cupboard; armoire
Arris—sharp edge of a squared board
Ash—hardwood
Aspen—hardwood
Astragal—moulding used in a barred bookcase door
Auger—long twist drill used with a brace
Awl—used for marking (scratch) or setting (brad)
Axe—roughing tool for chopping, cutting, or splitting

The Finishing Forum is an ongoing discussion about the art of wood finishing. If you have a question or a problem to solve, we'd like to help. If you have a tip or secret to share, or you recently tried a new product, write to: The Finishing Forum c/o PW, 1041 Shary Circle, Concord, CA 94518. Letters may be edited.

Antique Repair

I inherited an 18th century English mahogany highboy. It suffered some damage in shipping and also shows signs of age. But, the finish seems sound, and I'd rather not strip it. The damage is below the cornice, where there is a frieze of crossbanded 1/8" thick veneer. Some veneer pieces are missing.

On the lower part of each side there are whitish areas in the finish. Could

Tom Wisshack makes and restores fine furniture in Galesburg, Illinois.

this be water damage? How should I repair my piece and where can I get the right wood? What about the cloudy areas? How can I clean the finish to make the piece presentable?

David H. Mueller
Utica, New York

Judging from the thickness of the veneer and the time period, the piece is probably made of San Domingan mahogany. Honduran and African mahoganies are available today, but they lack the deep color and density of the mahogany in question. You'll have to find a repairman or antique dealer that's willing to sell you a small piece of matching wood. It may take you a while to find this species—it's now virtually extinct.

Clean out the missing areas of cross-banding and square up the edges to prepare for the new veneer. Make templates for the individual pieces by rubbing across heavy paper held over the opening. Use this as a guide in cutting

your veneer. Use hide glue and clamp the veneer in place. When dry, level the area with a cabinet scraper and sand through 400-grit sandpaper. Build up thin coats of shellac onto these areas, tinting white shellac with orange in small amounts to match the tone of the old finish. When it's dry, rub it down with mineral oil and rottenstone so that the repair blends with the surrounding area.

The cloudy areas on your cabinet will probably respond to a treatment with Liberon's Burnish Cream Scratch and Blemish Remover (Star Finishing Products, Box 86, Mendocino, CA 95460). Apply a liberal coat, let it sit on the wood for up to thirty minutes and rub with fine steel wool. When the color returns, allow the finish to dry overnight.

Clean your highboy with Naptha (a fast-evaporating solvent that won't harm the finish) and a soft cloth to remove any surface dirt and grime. Follow up with a high quality paste wax.

Tom Wisshack

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| ☐ #73 July 1993 \$4.50 | ☐ #40 Jan 1988 \$2.95 |
| ☐ #72 May 1993 \$4.50 | ☐ #39 Nov 1987 \$2.95 |
| ☐ #71 Mar 1993 \$4.50 | ☐ #38 Sep 1987 \$2.95 |
| ☐ #70 Jan 1993 \$4.50 | ☐ #37 July 1987 \$2.95 |
| ☐ #68 Sep 1992 \$4.50 | ☐ #36 May 1987 \$2.95 |
| ☐ #66 May 1992 \$4.50 | ☐ #35 Mar 1987 \$2.95 |
| ☐ #63 Nov 1991 \$3.95 | ☐ #34 Jan 1987 \$2.95 |
| ☐ #61 July 1991 \$3.95 | ☐ #33 Nov 1986 \$2.95 |
| ☐ #60 May 1991 \$3.95 | ☐ #32 Sep 1986 \$2.95 |
| ☐ #59 Mar 1991 \$3.95 | ☐ #29 Mar 1986 \$2.95 |
| ☐ #57 Nov 1990 \$3.95 | ☐ #9 Nov 1982 \$1.50 |
| ☐ #56 Sep 1990 \$3.95 | ☐ #7 May 1982 \$1.50 |
| | ☐ #2 July 1981 \$1.50 |



The Standards

Woodworking is a personal thing, an art that allows us to focus on creativity and express our individuality. Even though we interact with, and even be influenced by, others with the same interests—through personal contact, books and magazines that offer tool-use suggestions, construction ideas, and plans—we're still alone when we're in the shop. We're faced with a chore that needs doing or a project we select for enjoyment.

Whether it's one or the other, we are in control of the procedure and must judge if what we have accomplished is successful. It might not be an heirloom piece or one that will be selected for display in a museum; it might not even draw "oohs" and "ahs" from others, but our own satisfaction is paramount. Less than that is not acceptable. Unavoidably, this brings us to a particular consideration. Are there standards for *good* woodworking?

"Standards," taken literally, can be limiting—interfering with creativity; but there are goals to achieve that may have more to do with construction phases than with concept or visual effects. The reaction to what is visible is introspective. What can't be seen, although the elements I'm thinking of are often deliberately exposed, is a major mark of the worker's dedication to quality construction.

Most furniture, for example, is made to serve a particular function (utility), but there is usually an added element

(appearance). Many years ago, it was George Hepplewhite who said the purpose of furniture is, "To unite elegance and utility, and blend the useful with the agreeable." The *blend* is what we, as individual craftspeople, decide on. These factors are perennial. They are unaffected by changes in style which are usually a mode of the times, or the primary thought that any project is as good as its weakest joint.

A table is, essentially, a slab mounted on legs. Saw a piece of plywood to some shape and mount it on ready-made wrought iron legs and you have a table—strictly utilitarian. See it as something more and you may envision a hardwood slab with routed edges mounted on cabriole legs—the *line of beauty*—with shaped or plain aprons. This is an example of different strokes for different folks, or making choices strictly in relation to the project's purpose. Slab and wrought iron is more suitable for the patio or rec room. The more sophisticated version may match the home decor or gain a sense of accomplishment.

Either way, you can be faulted only if you have neglected fundamentals like joints, harmony, proportion and balance, and the fact that design follows function—always.

Good design demands that the project be successful for its intended purpose. A dining table that isn't 28 to 30 inches high and doesn't allow leg room between aprons and floor won't make it regardless of how impressive it might look. Installing a delicate drawer pull on a shop drawer for heavy tools is as incongruous as using a horseshoe for a pull on a drawer to store postage stamps. We can bend,

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for Good Woodworking



twist and shape wood to extremes to end up with, say, a *curvaceous* chair with tremendous visual impact, but can you sit in it comfortably?

Because engineering is integral to design, we must be satisfied that the construction is fundamentally sound. Invisible errors like a tenon running free in its mortise, falsely compensated for with a generous amount of glue, shouldn't bother anyone but you. However, you won't always be alone. Eventually, joint failure will reveal a "live-with-it" attitude.

Each component must be an integral part of the whole, leading to a sense of harmony. A thick redwood burl, as a table top, will be bothersome if mounted on spindly legs. It's necessary to view the understructure, to put it one way, as a means of combating the gravity that tends to collapse the slab. Sliding doors on the clone of an ancient wash-stand won't cut it, not unless your aim is a modern adaptation of the original design. Untethered imagination can lead us astray.

Projects should balance. Balance doesn't mean symmetrical, but the unit as a whole should appear to have its weight equally distributed so there will be a visual impression of poise and solidity. A friend, a good craftsman, built a respectable chest of drawers, but there was something about the project that was disturbing. The drawers varied in depth and I felt the distraction occurred because the deeper drawers were at the top, causing the project to appear top heavy. Picayune? Maybe.

Satisfaction in the workshop depends greatly on giving sufficient thought to an idea and working carefully thereafter, determined to produce something worthwhile while enjoying the process. The type of project isn't critical—it might be a bird feeder or a TV cabinet. Thinking ahead is a question of *seeing* the project and checking it all the way through its ultimate use. You can doodle on paper with a tape measure and you can go further, as I often do before starting construction, by working with cardboard and tape to assemble a small model of the project. I don't detail the model but I do scale it. This offers a pretty good preview and suggests changes to make before sawing wood. Thinking twice before turning on a sawing machine is as wise as measuring twice before cutting.

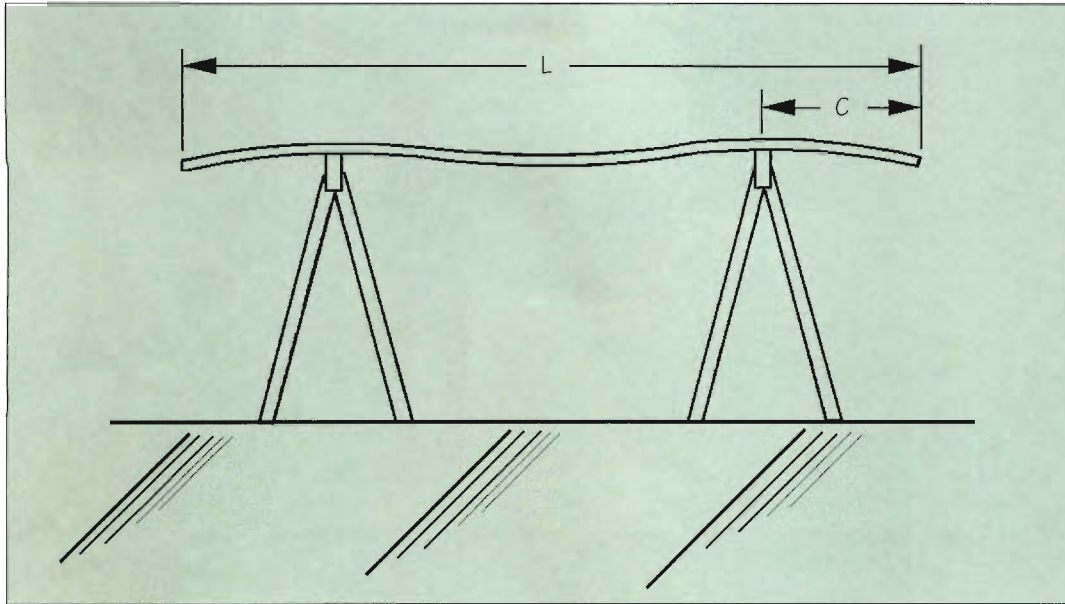
If we didn't have to consider utility we could really go hog wild, but detailed engineering or design calls for acknowledging the purpose of the project, a factor that often dictates size. Many dimensions are established by simple logic. Height between fixed shelves, for example, can be determined by the items you wish to store. Dimensions of furniture have everything to do with their relation to human proportions. That's why for most objects designed for use there is a width, depth and height that suits the average person. We can escape the norm but it can be risky. An overly high chair-seat that suits you because you are seven feet tall will dwarf your guests.

Overall—we as crafters, not concerned with production lines, can produce successful projects that suit our individuality, but we cannot ignore essential practicality. **PW**

Mathematics

For The Woodworker

Part 3



by Robert Calvert

In the second part of this article we covered measuring devices, beam compasses and some tips for drafting. This part covers some simple mathematical formulas—how to read and understand them and more importantly, how to enter them into your calculator and come up with the correct answer.

I recommend you keep a small note book handy to jot down the formulas that will be of most use to you in the future. Also write down an example using the formula to solve one of your typical problems.

It is amazing how many engineering formulas relate to wood working and I have used these often in this group of articles.

Since the formulas are entered on a hand held calculator, a brief description of is in order. The calculator used here is a Sharp model # EL-531D.

The terms “punch in” and “enter” are used interchangeably, since this type of calculator doesn’t have an enter key

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like a computer. I tend to think of numbers as being entered and functions—sine, tan, 2ndF, etc.—as being punched in. To further simplify the description of entering a problem using a formula, function keys are in a box. These are actual keys on the calculator and require a button to be pushed in the sequence shown. However only the function keys will be boxed to simplify.

For example: If I want you to divide 3.658 by 4.889 I will state it as: Enter 3.658 $\boxed{\div}$ by 4.889 $\boxed{=}$.748. Note that the numbers and decimal points all have separate key punches but are not boxed in—this to save space and eliminate repetition. The words in the above example (“enter” and “by”), make the reading flow. So to do this simple division, turn on the calculator (this is assumed) enter the numbers and the functions in their proper sequence and your display reads .748210267 which can be rounded off to .748.

This entry method is only for calculators with the algebraic entry system. If you’re using another type of calculator then modify the entry sequence. Also,

regardless of what calculator you use, any string of data must be entered in the same units of measure. For example, if you enter 12 for a 12' long 2 X 4 and then enter 3.5 as the width, the calculator will see the 12' as 12". To eliminate this, convert 12' into 144" and enter this number.

When I show the $\boxed{2ndF}$ key and the next button to push, it will be what is printed in white right on the button. I’m doing this for simplicity. For example, $\boxed{2ndF} \boxed{EXP}$ yields Pi (π) or 3.1416 in the read-out and has nothing to do with an exponent. I do this because the larger white inscriptions are easy to see and reduces the key nomenclature by nearly 50%. If you wish to be aware of the actual function of the key being pushed following $\boxed{2ndF}$, then simply look at the inscription directly above that key.

I’d like to start with something that’s not a formula, but an arithmetic problem. Several years ago before buying this do-everything calculator, I often had a need to convert angles expressed in degrees, minutes and seconds into decimal numbers. This calcu-

lator eliminates the hassle of long division to convert a degree angle to a decimal.

Let's take a random angle, say $41^{\circ} 18' 7''$. Enter 41 $\boxed{\text{DMS}}$ 18 $\boxed{\text{DMS}}$ 7 $\boxed{\text{DMS}}$ —the display reads 41.30194444. To convert back to an angle push the $\boxed{\text{DMS}}$ button one last time.

A handy way to calculate the diameter of any numbered screw is: the # times 13 plus 60. For a #10 screw the diameter equals: 10 $\boxed{\times}$ 13 $\boxed{=}$ $\boxed{+}$ 60 $\boxed{=}$.190. This formula is worth writing down.

All mathematical formulas use a sort of shorthand. Not everything is written down, but implied. Additionally, close attention to the placement of the symbols in a formula is of prime importance for correct usage and a correct answer. Look at a few basic symbols: +, -, $\times$ and $\div$. Of these, only two will be found in a formula, + and -. The $\times$ or times symbol is not written, but implied. On rare occasions a point (or period) in the middle of the line is used. For example, the formula for the circumference of a circle is πd , this means $\pi \times d$ where π equals 3.1416 and d is the diameter. Pi or π , the 16th letter of the Greek alphabet, is a mathematical constant and is the ratio of the circumference to the diameter of a circle. Since it's used in many formulas it's good to commit it to memory, but the calculator does have it stored.

The divide symbol ($\div$) doesn't appear in formulas either. It's expressed as a horizontal or diagonal line with numbers or values above and below the line ($\frac{7}{9}$).

Another symbol is the square root sign $\sqrt{\quad}$. It's a number times itself to equal the product. The square root of 25 is 5. $\sqrt{25} = 5$ or 25 $\boxed{\sqrt{\quad}} = 5$.

Next are exponents. These are small numbers placed above and to the right of a value indicating the power the value is to be raised or multiplied by itself. IE: $7^2 = 49$ or $7^3 = 343$. So 7^2 is $7 \times 7 = 49$ while 7^3 (7 cubed) is $7 \times 7 \times 7 = 343$. Exponents can raise a number very quickly— 7^8 is well over 5

million! You will rarely find more than the 3rd power of a number in a formula.

For the square of a number, you have the $\boxed{x^2}$ button and for the cube or higher numbers you have the $\boxed{x^y}$ button. Let's try the $\boxed{x^y}$ button. For 7^3 , enter 7 $\boxed{x^y}$ 3 $\boxed{=}$ 343. For fun, enter 7 to the 8th power. Enter 7 $\boxed{x^y}$ 8 $\boxed{=}$ 5,764,801.

One last thing we need to discuss are brackets— $\boxed{(\quad)}$ and $\boxed{)\quad}$. These are used when a portion of the formula must be completed first, or within itself. For example let's use the formula for the surface area of a sphere: $A = 4 \pi r^2$. This means $4 \times 3.1416 \times$ the radius of the sphere squared. The exponent only pertains to the radius being squared. If you wished for the entire formula to be squared (this of course makes the formula wrong) you'd bracket the values leaving the exponent outside— $A = (4 \pi r)^2$. This method results in an answer that's more than 100 times too large. Understanding how brackets are used is very important.

Let's look at another simple example. The formula for the perimeter of a rectangle is $P = 2(a + b)$, where a equals the length and b is the width. If you add the length to the width and multiply by 2 you come up with the correct answer. If you multiplied 2 times the length then added the width, as if the brackets weren't there, your answer would be one width short. Just remember to complete the equation within the brackets before you use the result in the rest of the formula.

The following formulas should be useful and warrant writing down. In all of the examples, r = radius, L = length, W = width, H = height, and bf = board feet—all are given in inches. Additionally, there are 321 in.³ (cubic inches) in one gallon.

Let's say you go to the lumber yard for a piece of *tropicus exocitus* for a turning project. The piece you need has to be $3\frac{1}{2}" \times 8" \times 8"$ and you've got \$20 in your wallet. The wood you want is \$11.95/bf plus tax (7%). A board foot is a piece of wood one foot square and

one inch thick (144 in.³). Let's do the math. Enter 3.5 $\boxed{\times}$ 8 $\boxed{\times}$ 8 $\boxed{\div}$ 144 $\boxed{\times}$ 11.95 $\boxed{\times}$ 1.07 $\boxed{=}$ \$19.89, YES!

The volume of a sphere is given as $\frac{4}{3}\pi r^3$. Take a ball that measures 9" in diameter. Enter 4 $\boxed{\div}$ 3 $\boxed{=}$ $\boxed{\times}$ $\boxed{2ndF}$ $\boxed{\text{EXP}}$ $\boxed{=}$ $\boxed{\times}$ 4.5 $\boxed{x^y}$ 3 $\boxed{=}$ 381.7 in³. At first, this string of button pushing may seem confusing. But if you take a close look it follows along with what is needed.

The volume of a cylinder is given as $\pi r^2 H$. Let's assume a glue bottle that's $2\frac{1}{2}"$ in diameter and 9" tall. Enter $\boxed{2ndF}$ $\boxed{\text{EXP}}$ $\boxed{\times}$ 1.25 $\boxed{x^2}$ $\boxed{=}$ $\boxed{\times}$ 9 $\boxed{=}$ 44.179 in³. The volume of a cylinder in gallons is given as $\pi r^2 H / 321$. This formula is nearly identical to the above except we divide the total cubic inches by 321 to get gallons.

Let's try an obscure formula which may come in handy from time to time. It's a beam stress and deflection formula. The beam must have the same cross section over the entire length—like boards of lumber. The formula tells you how far apart to place two saw horses for support with zero deflection. At first glance you might think it's half the distance to the center from each end or the $\frac{1}{4}$ mark, but it's not. The formula is $C = \sqrt[4]{L \cdot 828}$, where C equals the distance in from the end, and L equals the total length of the stock.

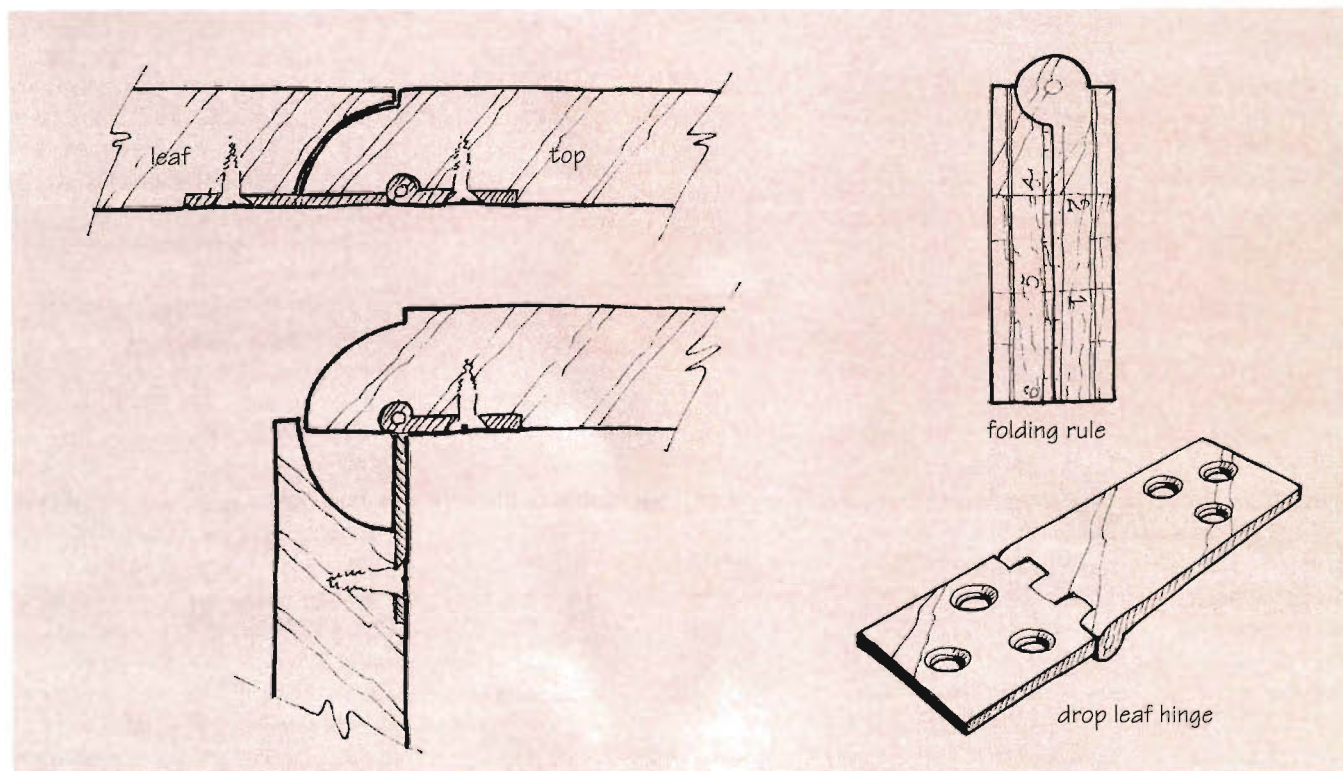
Let's use a nominal length of 20' Enter 240 $\boxed{\div}$ 4.828 $\boxed{=}$ 49.71—or a little less than $49\frac{3}{4}"$ in from the end. Our guess of $\frac{1}{4}$ of the length (60") is more than 10" off.

One last thing about calculators. Like computers, if the wrong buttons are pushed the read-out can be a bit strange or wrong. When you first turn on the calculator the read-out should say 'deg' in small letters at the top left, and '0' on the right. Anything other than this and you may not get the correct answers. Turn the calculator over and push the reset button.

Next time we will play around with the "Properties of the Circle" formulas. These are extremely useful in woodworking. $\boxed{\text{PW}}$

Hand Tooling Rule Joints

Using hand tools leaves room for error when practicing this demanding joint



A rule joint looks fairly straightforward, but, unless it's made with precision, can cause no end of trouble. It may bind or gap, hang wrongly or refuse to close evenly. To make a perfect rule joint requires a little understanding and a little practice. Consequently, using hand tools is a perfect way to learn this joint. You can work more slowly, you can proceed bit by bit and can make adjustments as you go along. There's none of the all or nothing, keep your fingers crossed panic that may ensue when you switch on the router for the first time and hope that you've made all the measurements and adjustments correctly.

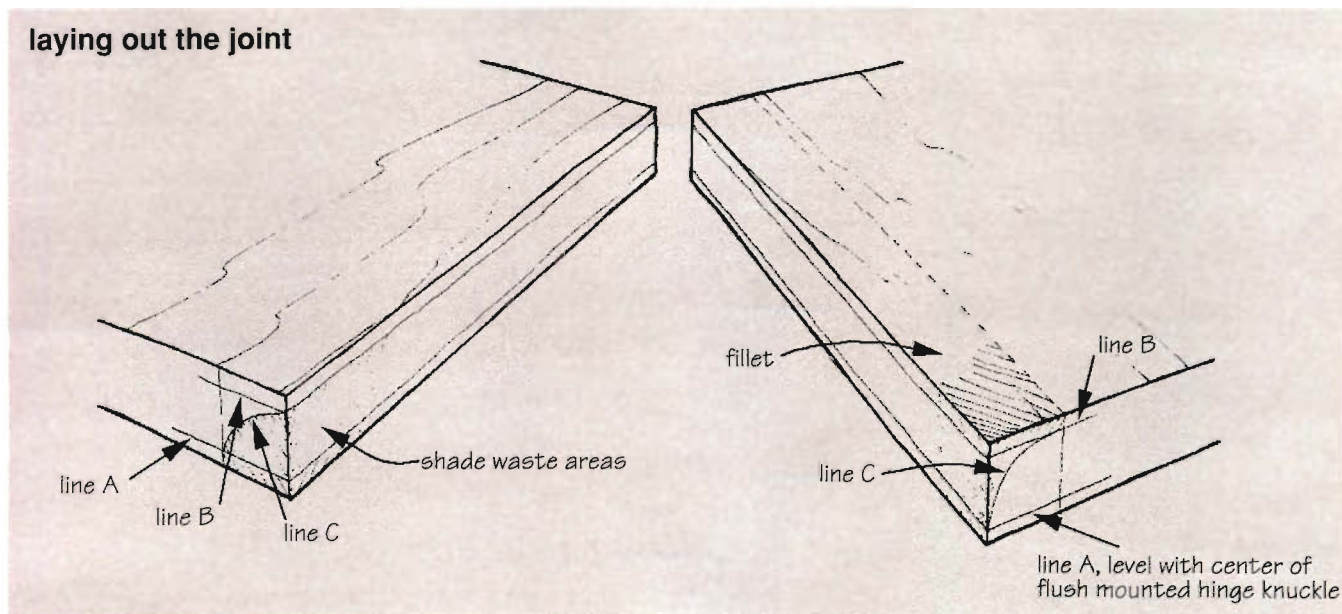
So what is this terrifying joint that looks so simple and yet contains so much room for error? Before the invention of folding wooden rules equipped with brass hinges called knuckles, after whose characteristic profile this joint was renamed in the eighteenth century, it was called the table joint. Although it sometimes finds other applications, its chief use is as the joint between a folding leaf and the tabletop of a drop-leaf table. Its advantage over a simple, hinged butt joint, like that used to hang doors, is twofold: first, when the

leaf is raised in the same plane as the tabletop there is no unsightly gap between the two parts, through which crumbs or small objects might fall; and second, excessive weight on the leaf is spread across the rounded edge of the tabletop rather than depending entirely on the hinge. Aesthetically, it looks better since the otherwise square edge of the tabletop is reduced by a fillet and a quarter-round presenting a smoother transition to the edge of the fallen leaf.

If you understand the geometry involved and can guarantee an accurate layout, by all means use a shaper or a router. They work fast and require minimum clean-up. But if you'd like to leave a little room for error and are not sure you have the correct bits, try making a rule joint by hand. The tools required are few. If you enjoy the process you might even look for a pair of table planes. At first glance these look like moulding planes—indeed, several kinds of very common moulding planes can be easily substituted for dedicated table planes—and are simple and safe to use. It is quite easy, however, to construct the entire joint using only a block plane and an easily made scratch stock. Rabbit planes or shoulder planes, and a hollow plane and a round plane may also be useful, but are not essential.

Graham Blackburn rules the joint and writes about it from Inverness, California.

laying out the joint



First the Hinge

The rule joint would not be possible without a special hinge made with uneven leaves. Much 18th century furniture that had drop leaves used iron hinges since the hinge is not normally visible. But brass hinges made specially for this joint are now readily available in a variety of sizes. They differ from normal butt hinges not only by virtue of their uneven leaves, but by the fact that the knuckle of the hinge is on the opposite side of the countersink machined in the leaves for the screws. The reason for one leaf being wider than usual is to accommodate the cove in the leaf. The reason for the reversed knuckle is, firstly, so that when the hinge is recessed flush with the surface of the wood it presents a perfectly smooth surface (useful for fall-front lids of desks where a regular hinge-knuckle would constitute an awkward obstacle to anything placed on the open desk top), and secondly so that any gap is avoided when the leaf is lowered, even if it hangs at an angle greater than 90°. The second point is a little harder to understand until you realize that when the hinge is set flush with the surface of the wood the reversed knuckle will necessarily be below the surface of the wood. Since the center of the knuckle is the center of the arc through which the leaf rotates, its top edge, when in the hanging position, is necessarily in line with the center of the knuckle, below the surface of the wood.

The Layout

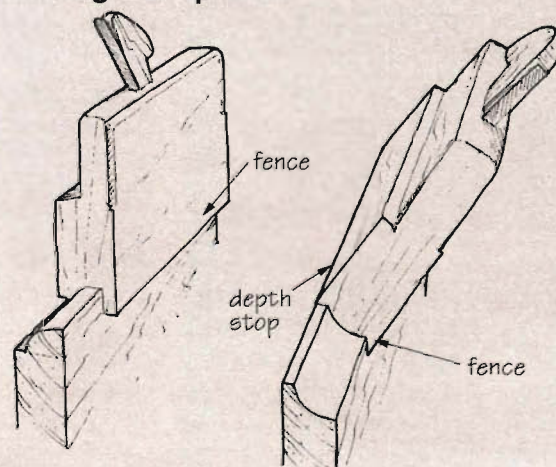
Understanding the correct layout is crucial to being able to make a well functioning joint. If the results are less than perfect, you may be able to make adjustments—using handtools—but only if you understand what is going on.

Start with perfectly square and straight edges on the tabletop and the leaf—both of which should be of equal thickness. On the ends and edges of these pieces use a marking

gauge to mark line 'A' as shown above. This line should be level with the center of the hinge knuckle when the hinge is set flush. Set the gauge by holding it to the hinge and adjust the pin to the center of the knuckle.

You can keep the gauge set to the same distance for the next operation or alter according to taste if you would like a different sized fillet. The fillet is the square edge cut in the tabletop at the bottom of which the rounded section starts. It is also necessarily the same measurement as the upper edge of the coved leaf, so you do not want it to be too thin and fragile. Depending on the hardness of the wood you're using, 1/4" to 1/2" might be sufficient. Scribe lines marked 'B'

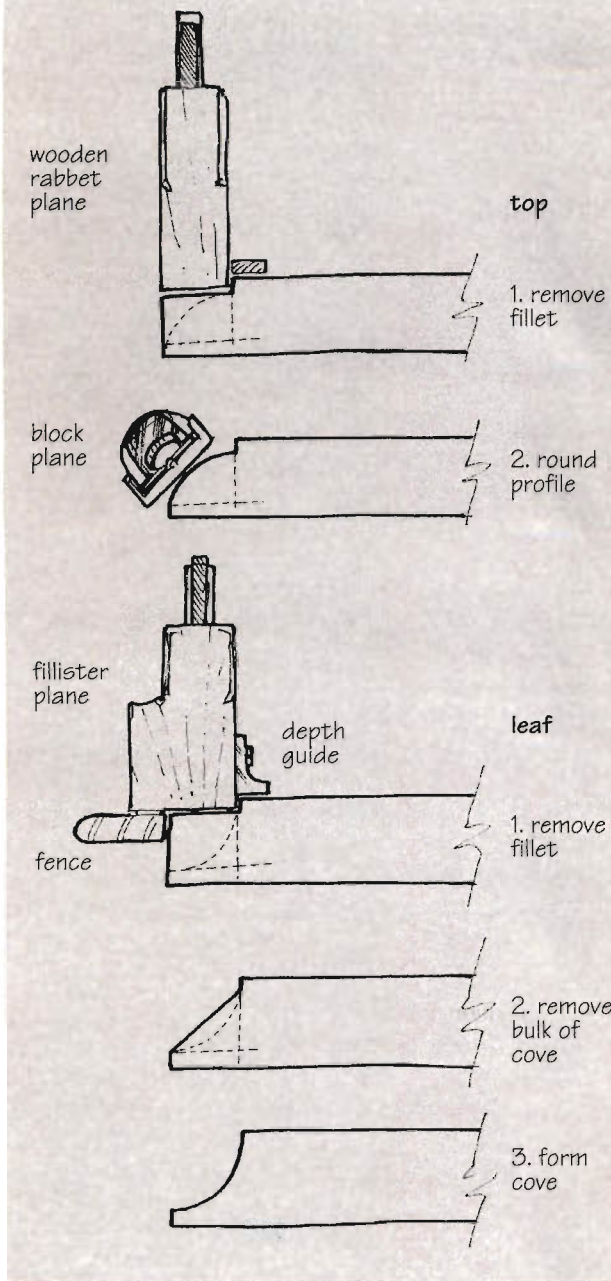
matching table planes



The top plane has a fence, but no depth stop since the blade must extend the entire width of the sole. Therefore, care must be taken not to plane below the scribed line.

The leaf plane has both a fence and depth stop, but must be held tilted with the fence against the sole.

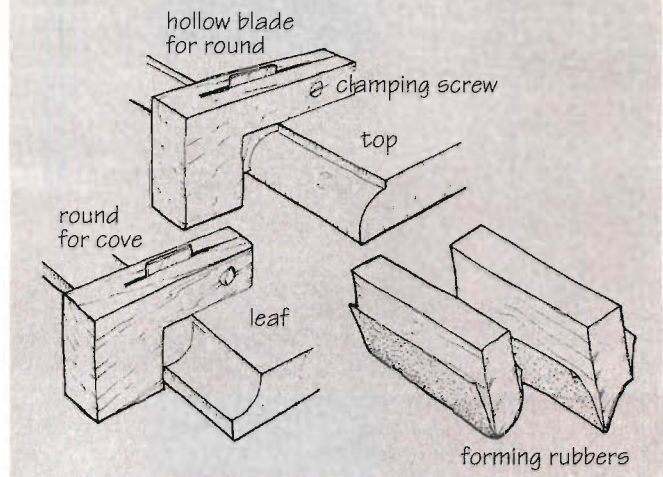
cutting the joint



with this setting on both ends of the top and the leaf and connect these lines along the facing edges of both pieces.

The distance between line 'A' and line 'B' is the radius of the circle used to form the rounded and coved edges. Measure this distance precisely and scribe line 'C' as shown this far in from the edge on the ends of both pieces. Using the point where line 'C' intersects line 'A' on the end of the top as center, scribe the quarter circle shown in the illustration, using dividers or a compass. When scribing the matching line on the leaf you may find it helps to hold a piece of scrap to the leaf's edge, since the center of the circle should be precisely at the edge. Note that from the point where the

fairing the profiles



quarter circle intersects with line 'A' on the end of the leaf, the line should continue straight down to the underside of the leaf, and not continue the circle.

The first time you do all this, shade the resulting waste areas with a pencil before continuing. This will make it much harder to make a mistake when you start to remove wood and you will have a clearer picture of the future joint as you start, especially as the pieces get moved around and turned upside down.

Removing the Waste

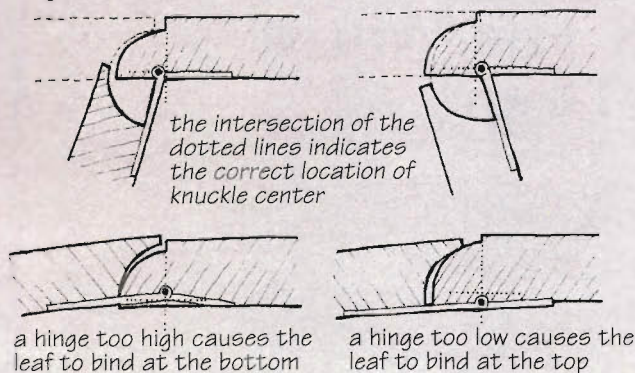
The simplest way to proceed is to use a rabbet plane (any square-edged plane whose cutting iron extends to the sides of the stock) to remove the fillet in the top and the similar waste area at the bottom of the leaf. Work carefully and do not go over the line. To be absolutely certain you do not make the fillet wider than it is supposed to be, connect the lines 'C' scribed on the ends—across the top of the top and across the bottom of the leaf. A simple rabbet plane has no fence, so you should clamp a straightedge to the top of the top and the bottom of the leaf to guarantee staying on the right side of the line. A fillister is a metal or wooden rabbet plane that has a fence and may also have a depth stop. Both of these make this first job very easy. Another option is to use a combination plane, such as a Stanley combination plane or a Record multi-plane. These planes have a variety of blades and adjustments and can be easily set up to produce rabbets of just the right dimensions.

To finish the round on the top, work carefully with a block plane and fair the shape with scratch stock fitted with blades filed carefully to the correct profile, or use a rubber. (A rubber is a piece of sandpaper held over a piece of wood matching the desired shape. Rubbers work very well, but the trick is to make sure the rubber is exactly the right shape too.) To work the cove needed on the leaf's edge, start by planing a bevel to remove most of the waste, being very careful not to go beyond the required outline, and once again finish with an

common problems: gapping and binding

a gap is caused by the hinge too far to the left

a hinge too far right prevents the leaf from closing



appropriately shaped piece of steel in the scratch stock. The blades for scratch stocks can be made out of almost any scrap piece of fairly hard metal, by simply filing the edge to the required shape.

The process can be sped up if you have a combination plane with hollow and round cutters, or if you have conveniently sized hollow and round planes. The combination plane is a little clumsy to use for such a relatively delicate operation, but it does have the advantage of fences and depth stops that help to prevent removing excessive material. Hollows and rounds are far simpler tools but require being held so that your fingers act as a fence. Once you get the hang of this, they are very fast and convenient.

For the dedicated drop-leaf tablemaker, a pair of table planes is the easiest way to go. Since they cut a single-sized, matching rule joint, it is necessary to plan the layout around the planes' dimensions (also making sure that you are going to use appropriately sized hinges), but their use is virtually foolproof, providing you pay close attention to the gauged lines 'C', which marks the limit of the fillet in the top. This is necessary because the plane that cuts the fillet and round in the top, although it has a fence, has no built-in depth stop because the cutting edge extends all the way across the sole of the plane. This allows it to cut rule joints with fillets of different depths to accommodate different thicknesses of tops. The matching plane that cuts the cove does have a depth stop, and needs only to be held firmly against its fence at the correct angle.

Trying the Fit

Try both pieces together until you have a good fit, being sure that the top surfaces of both leaf and top are level. Slide the pieces laterally against each other; this can help locate any bumps. Now clamp the two pieces together upside down, with a strip of paper between them to provide a little clearance, and lay out the hinge mortises—be sure to center the knuckle over the joint.

When the mortises are fully excavated, fix the hinges (two are usually sufficient) with a single, slightly undersized steel screw in each leaf. If the hinges need to be repositioned there will be fewer holes to fill; and if you need, to remove and reinsert the screws several times, steel screws are less likely to break than the brass ones supplied with brass hinges. Furthermore, the smaller size will allow the brass screws, when finally inserted, still to have enough wood to grip.

Now for the moment of truth: turn the joined leaf and top the right way up, and, supporting the leaf, try the joint. The most common causes of binding or gapping are shown at left. The cure for these faults should be obvious: usually a slight repositioning of the hinge will be all that is necessary, but sometimes a little judicious work with the block plane or scratch stock will do the trick, especially if the round and matching cove are not perfectly matched. Since the round is visible when the leaf is dropped, be sure to leave this as perfectly round as possible and make any adjustments to the fit on the cove of the leaf. Be sure there are no bumps or chips in the joint. Sighting along the joint from the ends while moving the leaf makes it easier to see the bad spots.

A Few Tricks

The process just described is theoretically correct, but in practice it's sometimes easier to anticipate certain problems and build in a little allowance. Such a process lies at the heart of much successful woodworking which is, after all, largely a matter of accommodating an inherently unstable material to the uncompromising exactness of theoretical design.

The paper trick is good for ensuring clearance, but a surer way is to position the center of the hinge knuckle slightly towards the leaf, no more than $\frac{1}{32}$ ". The raised leaf will still close, seasonal variations in dimension are less likely to affect the joint, and the round section on the top is less likely to become rubbed or scratched.

Relieve the bottom edge of the round on the top with a few passes with the block plane. This will not be visible and will ensure that the leaf cannot bind here.

Although you may find older tables with drop leaves supported by hinges that have not been recessed flush with the bottoms of top and leaf, resist this apparently easier method since the result is a gap when the leaf is dropped, especially if the leaf hangs slightly inwards rather than perfectly vertically.

Lastly, although you may be tempted to use the wax or candle trick to lubricate the joint, do this only after the finish has been applied, otherwise the wax may inhibit a perfect finish. It is better to start with a properly fitting joint.

Next time: supporting drop-leaves, guaranteeing a coplanar relationship between leaf and top, controlling the angle of dangle, an alternative beaded table-joint and making the hingeless knuckle-joint—by hand. **[PW]**

A Better Mousetrap Will Not Lead The World To Your Door!



Emerson wrote, "If a man write a better book, preach a better sermon, or make a better mouse-trap than his neighbor, tho' he build his house in the woods, the world will make a beaten path to his door." This may have been true in Emerson's time, but it certainly isn't true today. A much better expression for our world is, "If you don't toot your own horn, no one will toot it for you." Talent alone is not enough. You must publicize yourself and your work in order to succeed as a professional craftsman.

I am often asked, "Why publicize yourself? Isn't it enough to just publicize your work?" The answer is no, because you and your work are inseparable. In the beginning, your work develops your reputation; later your reputation promotes the sale

of your work. Furthermore, your reputation as a craftsman enhances (or reduces) the value of your work. Once you have a reputation, gallery owners will hold shows of your work and feature your name to bring people into the gallery. People look at work in a gallery, and if they like it, they look to see who made it. If they recognize the name as someone they've heard of or read about, they are much more likely to buy the piece.

Publicizing yourself and your work is not easy, nor is it inexpensive. Nor is it done in a day, a week, a month, or even a year. When I started as a professional furniture maker, it took more than two years to build my reputation to the point where I had a backlog of orders.

There are two types of small woodworking operations, the one that creates a number of specific products and builds them in quantity (mass production), and the custom craftsman who builds individual pieces to order. For each of these there is a different way of developing your reputation and selling your work.

If you have any questions on the subject discussed in this article you may direct them to Ken Sadler, 75 NW 90th Ave., Portland, OR 97229. If you are a Compuserve user, the address is: Ken Sadler 76334,735. Mr. Sadler would also be happy to advise you on any other business related problems.

Marketing for Mass Production

For the builder of specific products in quantity, there are three avenues to success: 1) through retail stores or mail order catalog houses, 2) direct to the consumer, and 3) by mail order, on your own. Each of these avenues has its pros and cons.

In stores or catalogs. The route through retail stores and mail order catalog houses has one major drawback as far as the small operator is concerned: your take is going to be, at most, 50% of the retail price.

The small store route has three paths. The easiest and least expensive for someone just starting in business is to put samples of your products in the car, and make the rounds personally. The main disadvantage with this is that it's very time consuming, and once you've built up a substantial backlog of orders, you won't be able to do both the selling and the making.

The second way is through manufacturers representatives. These people cover sizable areas, usually several states, and represent a number of different manufacturers in the same field. However, you don't want one who also represents a competitor. Good "reps" are hard to get because they usually have a full list of clients. If they like your line and think they can sell it, and if your commission rate is attractive enough, you can probably persuade one to take you on. Be careful in this selection process; a lot of your future is riding on this choice.

The third path, trade shows, is for many the most interesting and exciting—at least for the first several times they tread it. At different times of the year, in major cities around the country, large trade shows are held. The participants are makers, large and small, of the items found in stores and mail order catalogs. The people coming to these shows are the store buyers, and they usually buy for a season or sometimes for the whole year. I have a friend who works three shows a year: one each in the east, the midwest, and the far west. He gets 75% of his annual sales from these three shows.

Doing a trade show is not cheap. The cost of even a small booth is several hundred dollars, and since the show usually lasts a week, you have the cost of a hotel and meals plus the transportation to and from the show city. It all adds up to a tidy bundle. The cost effectiveness obviously depends on how many orders you get.

If your line sells well, this can be a better method than using a rep and gives you better control over your marketing process. You will have to pay the rep a 10-15% commission, which is figured on your selling price and therefore must be included as a marketing cost when calculating your prices. The costs of the show are also a marketing cost, so when comparing the costs of the two methods, compare the cost of the shows against the rep's commission for an equal dollar amount of sales.

An excellent example of success at trade shows is

Michael Elkin, who I wrote about in this space in July '92. Michael makes beautiful boxes from maple burls, and he started from scratch with a first show at the Oregon State Fair. The quality of the boxes created Michael's reputation as he moved from the state fair to the trade show circuit. Today, 15 years later, the stores and galleries all over the country sell boxes by Michael Elkin, and he does about a half million dollars a year in sales.

Selling directly. The use of the direct sales route will depend on what you see as the future of your operation. If you're content to stay small, a one- or two-person outfit, making a good living and perhaps a little extra, direct sales will serve you forever. On the other hand, if you want to grow and eventually get into the big bucks, then it will only be a good beginning. Economically, its big advantage is that you get the whole retail price. This provides quite a bit of financial elbow room when you're just getting going. Added advantages are that the costs here are the lowest of any of the methods, and you get into close contact with your end users. This allows you to monitor what sells, what doesn't and why.

For direct sales, I recommend combining two approaches, if you can: 1) your own showroom and 2) a booth at consumer shows and/or local markets. Having your own showroom presupposes that, either you live in an area where you can have the store connected to your living area, or that your workshop is in an area where people come to shop. If you have to open a separate store, the cost rises dramatically, and I would advise against it.

The consumer show and market circuit, at least here in the Northwest, has proven to be very good. You build a knockdown booth that you can carry in a small pickup or on the top of a station wagon, load boxes of product and off you go. Selling this way lets you live wherever you wish. My best example of such a market is the Portland (Oregon) Saturday Market. This is held in a riverfront park every Saturday and Sunday from the first of April through Christmas. There are over three hundred booths and 3000-5000 people go through the market each weekend. This type of business makes for a nice routine: make the stuff all week, sell it over the weekend for eight months of the year then take off for the other four months.

There are also a number of national shows similar to the trade shows mentioned before, except that they cater to consumers rather than store buyers. Some are held annually in different cities each year. Others travel from city to city all year long, and you can choose the cities where you want to participate.

Mail order sales. The third route, mail order, consists of advertising in magazines and newspapers and offering a free catalog or brochure. You get your orders from the catalog, not the ad. This way, you build a mailing list of people who are interested in what you have to sell. The ads can be smaller and will cost less, and more people will write for a free catalog than will order an item directly from an ad. Once

The Business End

you've built a mailing list, the amount of advertising can be substantially reduced.

One advantage of this approach is that you get the retail dollar; unfortunately, the costs are quite a bit higher than direct sales. Another advantage for some folks is that here, as in direct sales through the craft markets, you can live anywhere you please. To me, the big disadvantage is that you have no personal contact with your buyers at any level, and monitoring product acceptance is difficult. Also, in mail order you must ship within 24-72 hours after receiving an order. This requires carrying a much larger inventory than any of the other marketing methods.

Marketing for Custom Work

For the builder of custom products, designed and built to order, the problem of reaching the consumer is entirely different. Most of the emphasis is on selling rather than marketing. The output is small compared to that of the production shop, and the volume of sales, as well as the prices obtainable, depend almost entirely on the reputation of the craftsman. This reputation is developed by the style of the work you have created, by your craftsmanship, and by the amount of work you have been able to get into the hands of the public. Some examples of products that fall into this category are furniture, sculpture, carvings, architectural woodwork, and built-in cabinetry.

The best approach. Having been involved in custom woodworking for many years, I have come to the conclusion that, today, there is only one way for a person just getting started in the business to market and sell his work: direct sales. Deal with your customers directly from your own showroom, at art shows and craft markets, and through reputable galleries. The amount that goes through the galleries should be small compared to the other avenues because galleries take up to a 50% commission. However, gallery sales are essential, because this is where you begin to build the kind of reputation that brings big prices later on.

Pricing. Never put a lower price on your work when selling it direct than you put on it in the galleries. If you do, the galleries will stop carrying it. In the beginning, when you have no name, the worst mistake you can make is to price your work too high. Pricing it low to medium accomplishes two things: it allows people to consider a piece without price being a major factor, and it gets your work out into peoples homes and offices where others can see it.

If the work doesn't seem to be moving, you need to alter your style. Try to talk to potential buyers about your work. The best places to do this are the art shows and craft markets, where you have a booth with a number of pieces on display and lots of people wandering by.

There is, I've found, a very good way of determining when you should increase your prices. When you have a three-month backlog, raise prices a little; when the backlog get to six months, raise them some more. By the time my

backlog had reached two years, I was asking and getting almost six times as much per piece as when I started. The process took four years.

Get out there and sell. I said earlier that, for this kind of business, selling was more important than marketing. I have just outlined what I think is the only viable marketing method. To make it work you will have to be a good salesman. Concentrate on the person your talking to, never leave your booth unattended, and always try to speak to, or at least acknowledge, everyone who comes into it. This may sound like a tall order, but it pays big dividends.

Your own showroom should be clean and neat and as elegant as you can make it. Use your imagination, and make people feel that you are just as much an artist as a craftsman. When people come to your showroom, give them your full attention and treat them as you would treat guests in your home. If this causes you to lose some work time, don't worry, you will gain from every minute you spend doing it.

You will seldom sell the samples you have put on display but they are important because your customers will relate to them and ask you to make variations of them. In the long run, this is an advantage because you won't have to spend time remaking your show pieces. I had one small cabinet around for several years, and took at least five orders based on it.

Enhancing your image. Get professional color photographs of each of your pieces, and mount them between plastic sheets in a fine, leather-bound book. Keep this book available in your showroom and at shows. Make a similar one for each of the galleries that carry your work.

Create a card, somewhat larger than a business card (it should show the location of your showroom), and have a supply on hand at all shows and markets as well as in each gallery. People pick up such cards and carry them home for future reference. I have had people come to my showroom as much as two years after they picked up my card.

No matter which type of operation you have, custom woodworking or mass production, if you want to sell your mousetrap, you better get out there and toot your horn. **PW**

Trade Show Info

Finding trade shows: *Trade Shows World Wide*, published by Gale Publishing Co. (Dewey Decimal Number - R607.34 T7635)

This book lists every type of trade show and is indexed by category. It also lists show sponsoring organizations and the shows they sponsor.

Finding when and where shows are scheduled each year: *Trade Shows & Exhibits Schedule* (Dewey Decimal Number - R607.34 T764)

This directory is published annually. Both of these books should be available in most libraries.



Hope Chest

This Oregon walnut chest is a holder of dreams. Frame and panel construction make it a sturdy and functional piece of furniture for the bride to be.

by Ken Sadler

One day a couple came to me and asked if I would make them a chest for their daughter. I agreed and as I began to design it I decided that, because it was a hope chest, it should be something more than a box with a hinged lid. The chest herein pictured and described is what I created for them. It has several features that make it different from most chests and more interesting to build. There are a few things you'll need that you might not have around your shop, so I'll tell you about them now and you can get them ahead of time.

You'll need two 1/4" T-nuts, two 1/4" X 11 1/2" NC machine screws, and two pieces of 1/4" ID copper tubing 3/4" long. The preparation and use of these will be explained later. To hold the lid open you will need a lid support. I recommend the hinged version that locks in the open position. You will also need four long bar clamps.

This chest consists of four framed panels and two solid panels. Of these the front, ends and lid are the key to whether you will have a beautiful piece of furniture or just an ordinary one. Look for unusual grain patterns and carefully match these patterns in the various boards to make each panel look as if it were one board—then you'll have something truly beautiful. If you're haphazard in your choice of wood and the way you glue it up, your piece will look ordinary indeed. In every piece of furniture I've designed, the lines are simple and plain and the wood provides the beauty in the piece. This approach takes time and thought but the results are well worth the effort.

Glue up the panels to the following dimensions, the thicknesses are finished, the length and width are rough: two pan-

els 1/2" X 17 1/2" X 44" for the front and back, two panels 1/2" X 16" X 19" for the ends, one panel 3/4" X 19" X 48" for the bottom, and one panel 3/4" X 20" X 47" for the lid. I've found that the plain edged butt joint is the best and easiest to make for this type of panel. I hand plane the edges of each board so they're slightly hollow in the center. When I pull the centers together with the clamps, it puts the ends in compression. Since the ends lose or gain moisture faster than the center they have a tendency to move more. This lessens the possibility of the joint opening at the ends. A word here about gluing. I'm a great advocate of the dry run. I gather all the things



Stand the leg blanks on end with their jointed faces mating and mark them A–D and inside/outside.

needed to do the job: supports, clamps, pads, etc. and then clamp the job up without any glue. In this way I can check to see if the joint is right, whether it closes properly, and make sure everything I need is at hand where I can reach it quickly. There is nothing more frustrating than to have the glue in place and find that the joint doesn't fit properly or that you're missing a clamp or pad or the clamp's not set properly.

The Front and Rear Frames

The front and rear frames should be made first because they control much of what happens later. The important point here is that while the two frames don't have to be exactly the size shown on the drawing, they both have to be exactly the same. Start by cutting the stiles and rails to finished size. The top rail and both stiles are 2" wide and the bottom rail is 2½" wide, all parts are ¾" thick. Don't cut the curve on the bottom rail at this time. The frames are assembled with open-end mortise and tenon joints. The stiles have the mortises and the rails the tenons. By doing it this way, you accurately position the long mortise at each end of the frame. This is very important, as you'll see later.

When you've cut all the frame parts to size, arrange each frame with the parts in their relative positions and mark the inside face and inside edge of each piece. Also, mark the top end of the stiles. The markings I indicate are very important. There are some complex assemblies involved in this project and without the proper markings it's easy to become confused and make mistakes that will result in having to remake the parts. Fasten a high auxiliary fence to the rip fence on the table saw. Set up your dado head cutter for ¼" width and ¼" depth of cut. Set the fence so that you cut the ¼" groove in the exact center of the ¾" edge of the frame pieces. Cut the groove on the inside edges of all frame parts, then cut a similar groove on the outside edge of the stiles. Now without

moving the rip fence, raise the dado blade to 1¾" high and cut the open-end mortises in the top ends of the stiles. Raise it to a height of 2¼" and cut the mortises in the bottom ends of the stiles.

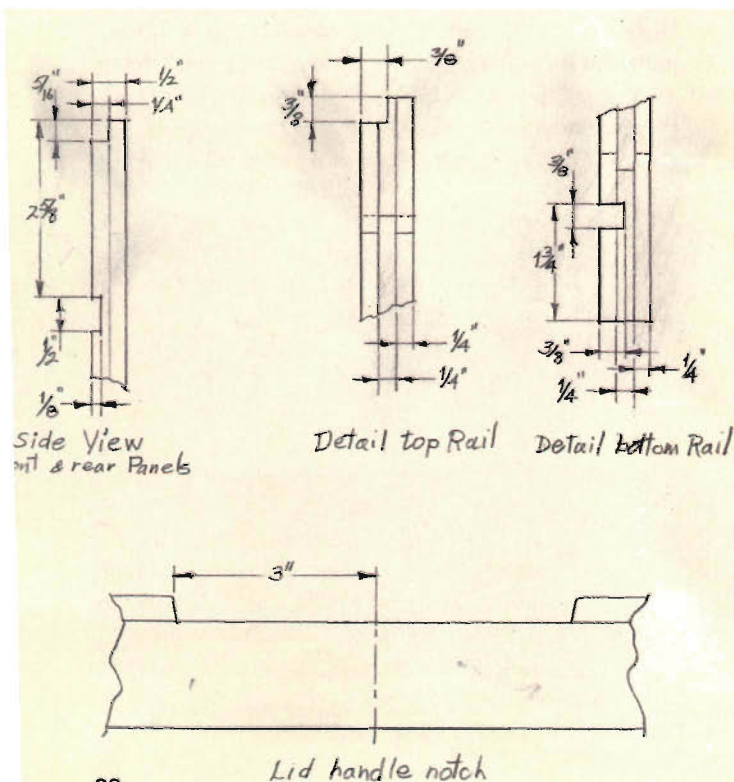
The distance between the tenon shoulders on all the rails must be exactly the same. It's best to cut the shoulders first and then finish the tenons. Be sure the rails are all exactly the same length. Set the saw blade to ¼" and the rip fence to 2" from the far side of the blade. Check that your miter gauge is set at 90°. Don't depend on the readings on the gauge, set it with a good try square. Now, using the rip fence as a guide, cut the shoulders on both ends of all the rails, then go ahead and finish the tenons. Arrange the parts again in their relative positions, with the inside faces up, and number the parts of each joint, 1-1, 2-2, etc. Fit the joints so that they are a light-pressure slide fit. If one is tight, take a shaving off alternate sides of the tenon until you get the right fit. With an open end joint such as this, a tight fit tends to spread the upper end of the mortise and you'll get a poor joint.

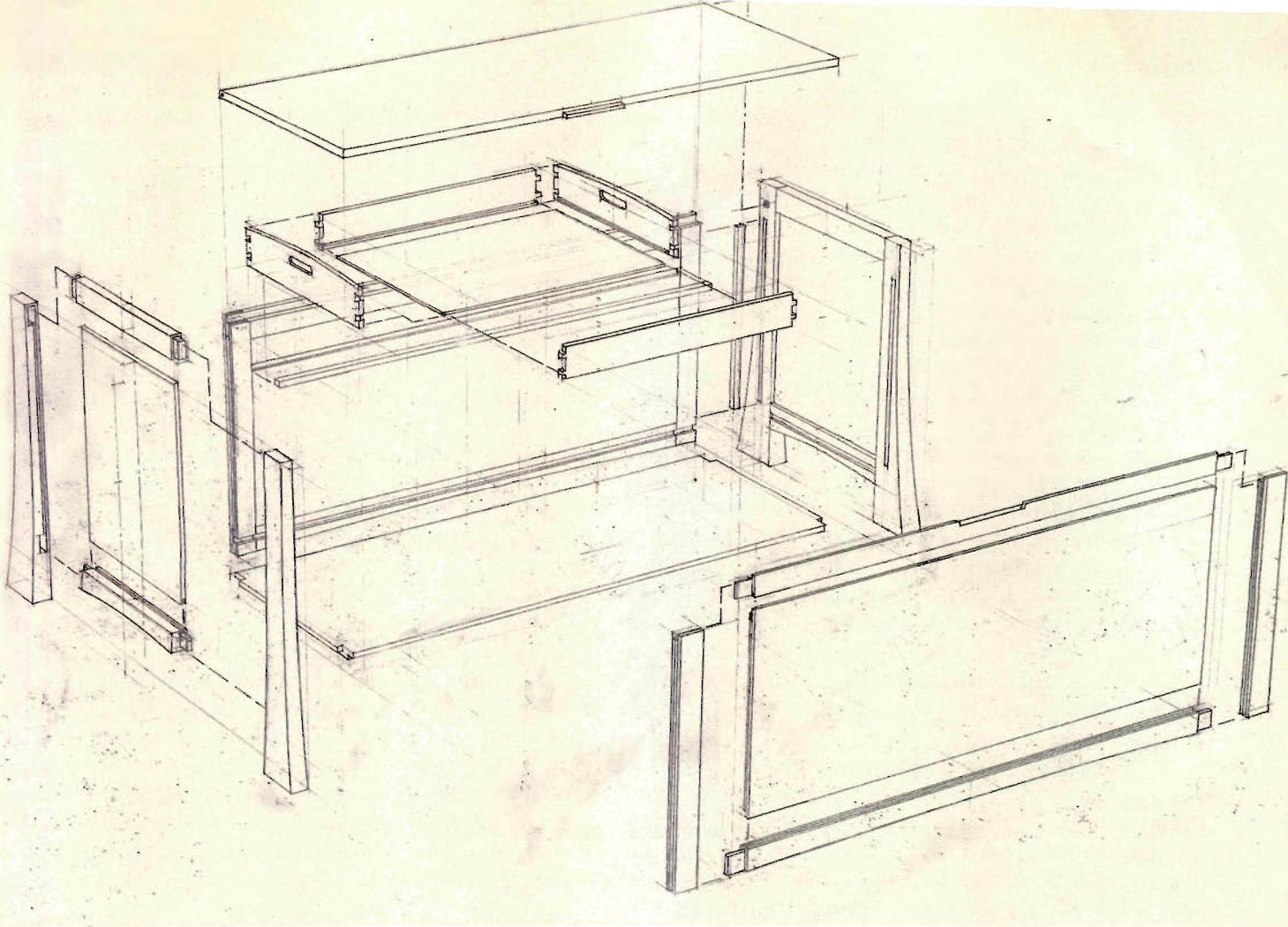
Assemble the frames, square them up by measuring diagonally between corners, then clamp them lightly but firmly. Measure the width and length of the frame opening from the bottom of the grooves. Deduct ⅛" from those dimensions and cut the front and rear panels to those sizes. Check them for square and if they're not, make them so using a hand plane. Choose which face of the panels you want to show and mark the other one "inside." Also, indicate the top of the panel by marking on the inside face.

The next step is to cut a ⅝" wide X ¼" deep rabbet on all four edges of the inside face of both panels. However, before you do this, take a piece of scrap that's the same thickness as the panel and cut a test rabbet on it. Test this flange in the inside-frame grooves. It should be an easy slide-fit. Adjust your setting on the table saw until this is so on the test piece. Now cut the rabbets on the panels.

Disassemble the frames and reassemble them with the panel in place but with no glue. Make sure all the joints go home and that the assembly is square. You should now have both front and rear frame assemblies to the same point of construction. Again, take the assemblies apart and cut a ½" X ⅝" deep groove the length of the panel on the inside face. This groove must be exactly the same distance from the top edge on each panel. The surest way to do this is on the table saw with a dado head cutter. It's important that both panels be cut on the same setup because this groove holds the rail the trays rest on. If they're not the same distance from the top, you'll have trouble fitting the trays in the chest properly. Finish sand the panels at this time.

Now glue up the assemblies. The glue goes in the corner joints only, not between the frame and the panel because the panel must float in the frame to accommodate expansion and contraction. In gluing an open-end joint like this I've found that it's best to put the glue on the upper half of the mortise and never on the tenon. Put the joint together from the top down, rather than from the side in. If glue comes out of the joint don't wipe it up—you'll only wipe it into the pores of the wood and you'll never get it out. Let it dry and later remove it carefully with a sharp chisel. Use clamps to hold it and make a last check for squareness.





When the frames have dried at least 24 hours, do the last three operations on them. Cut a $\frac{3}{8}$ " X $\frac{3}{8}$ " rabbet on the top inside edge and a $\frac{3}{8}$ " X $\frac{3}{8}$ " dado along the inside face of the bottom rail. Do this operation on both frames with the same saw setup. Now layout and bandsaw the curve on the bottom rail as depicted above. Smooth this cut with a spokeshave and put a slight radius on the outside corner. Cut the notch for the lid handle in the center of the rabbet lip of the front frame. Finish sand the frames.

The End Frames

These frames are the trickiest part of the project. They require multiple mortises on different faces, which must be related to each other with precision or the chest won't go together properly. They also must be shaped, but don't do this until everything else has been completed and the frames are ready for final assembly.

Start by cutting the leg blanks, $1\frac{3}{4}$ " X $4\frac{1}{2}$ " X $25\frac{1}{2}$ ". Joint one face and one edge on each. Stand the blanks on end, group them with jointed faces mating, then mark them as shown in the picture on page 27. Pair A-D are the front legs and pair A-B will be the left end legs. Lay them side by side with the jointed edges up so they line up with all the ends flush. At $5\frac{3}{4}$ " from the bottom draw a line across all four legs perpendicular to the jointed corners. On each leg, using a square, bring the line around on the jointed face. It's very important that these lines be exactly the same on all four

legs. They designate the bottom of the long mortise for the front and rear frames and the top of the mortise for the bottom stretcher of the end frames.

Set the leg blanks aside and make the top and bottom stretchers. Mark one face and one edge of each stretcher as inside, don't do any shaping at this time, simply mark them as shown in the figure above. You'll notice in the figures on page 30 that there's a $\frac{3}{8}$ " X $\frac{3}{8}$ " groove on the inside face of the bottom stretcher whose position is not indicated. This will be explained later. The distance between the tenon shoulders on all four stretchers must be exactly the same. Cut the tenon shoulders as you did for the front and rear frames. In making the tenons, all measurements are made from the inside corner. With the tenons and the grooves cut, lay the legs and stretchers for each end-frame in their proper relative positions and mark the joints 1L-1L, 2L-2L, etc. for the left frame, and 1R-1R, etc. for the right frame. You may laugh at my insistence on all these markings, but later on you'll be very glad you did it, especially if you have to leave the project and come back to it several days later.

This is where you lay out the mortises on the legs. All measurements are made from the jointed corners. On each leg place the upper edge of the tenon of the bottom stretcher on the line you've drawn on the leg edge and from the tenon mark the bottom of the mortise. Measuring from the inside face of the leg, draw the outer vertical edge of the mortise. Use a marking gauge to do this so you'll get this distance the

same on all eight mortises. Get the actual thickness from the tenon and draw the inside vertical edge of the mortise. The mortise for the top stretcher is laid out the same way except that the top edge of the stretcher is matched with the top of the leg and both the top and bottom lines of the mortises are marked from the tenon. Draw the lines for the $\frac{1}{4}$ " wide groove that connects the two mortises. There is only one mortise on the inside face of the leg. Measuring from the inside corner, draw the inside line for this mortise. Use a marking gauge to get it the same on all legs. The bottom end of this mortise must be exactly on the line you have previously draw. To get an accurate length for this mortise, measure the one on the ends of the front and rear frames which it must match.

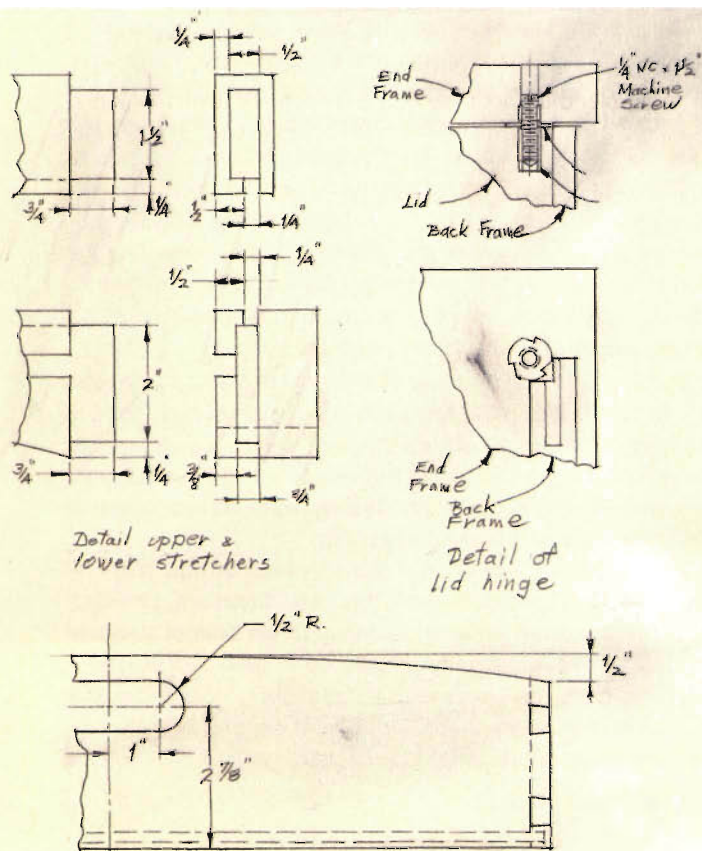
When cutting a blind mortise, I always drill out the waste material on a drill press and then finish it to size with a chisel. Make it slightly deeper than the length of the tenon. When it comes to the long $\frac{1}{4}$ " wide mortises, you'll probably want to cut them with a router. However, you must have a guide that you can set and lock, so you can position the router exactly the same on each leg. Don't try to route to the bottom edge of the face mortise. Stop a little short and finish the cut with a chisel. The location of this edge is so important that if it differs by as little as $\frac{1}{16}$ " between legs, the final assembly will be very difficult.

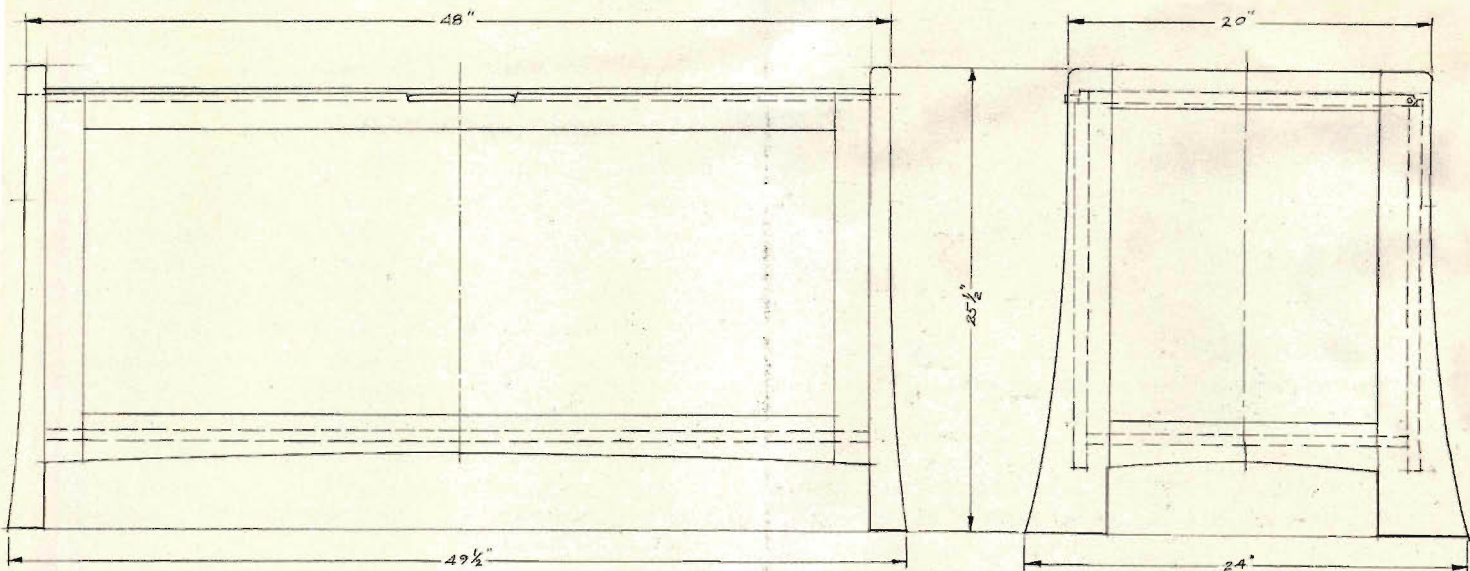
At this point you have to do some temporary assembly. First, cut four splines, $\frac{1}{4}$ " X $\frac{3}{4}$ " by the length of the face mortise on the legs. Fit these to the face mortise and to the mortise on the ends of the front and rear frames. You may find that the latter is slightly less than $\frac{1}{4}$ " wide. If it is, use the table saw to skin the part of the spline that fits into them until you get an easy press fit. Now, assemble one of the end frames on the bench with the inside face up. Clamp it together and place a spline in the leg mortise of one leg. Assemble

the front or rear frame to the leg and holding it in position mark on the leg, with a sharp knife, the position of the $\frac{3}{8}$ " groove in the bottom rail of the frame. Remove the frame and transfer those marks to the bottom stretcher. Disassemble the end frame and cut the $\frac{3}{8}$ " X $\frac{3}{8}$ " dado as indicated by the marks. Repeat this process for the other end frame. Now glue the splines in the front and rear frames. Put the glue along the sides of the mortise, not on the spline. While the glued splines are drying cut and finish the end frame panels. Get your dimensions the same way you did for the front and rear panels. Check the perspective drawing for details and which one should be the inside face. Reassemble the end frames with the panels to see if everything fits properly. Clamp up one frame and place it on the bench with the inside face up. Assemble to this both the front and rear frames. You'll probably need an extra pair of hands to help you here. Measure the distance between the bottom of the $\frac{3}{8}$ " grooves in the front and rear frames. This, less $\frac{1}{8}$ ", will be the width of the bottom. Measure the length of the front frame (less the splines). This, plus $1\frac{1}{16}$ ", will be the length of the bottom. Cut the bottom panel to size. Cut a $\frac{7}{16}$ " wide X $\frac{3}{8}$ " deep rabbet on all four sides of the bottom. As with the earlier panels, get a piece of scrap that's the thickness of the bottom and run a test rabbet to make sure it fits the grooves in the frames. Make adjustments until it does, then cut the rabbets on the bottom. Measure the length of the groove in the bottom stretcher. Find the center of the ends of the bottom and measure from it in each direction one half of the distance you just got less $\frac{1}{8}$ ". Cut $\frac{3}{8}$ " deep notches from this mark to the side edges of the bottom. This gives you what is in effect a tenon on each end of the bottom.

It's time to make a dry assembly of the complete chest. First assemble and clamp up the end frames. Position one clamp across the top edge of the frame and the other across the inside face near the bottom. From here on an extra pair of hands will again come in handy. Lay one of these assemblies, inside face up, on the bench and place the front frame in position. Insert the bottom, flush face to the inside, into its grooves on these two frames, then slide the rear frame into position. Fit the other end frame to complete the chest assembly. Put a clamp from end to end on each side to hold it all together, then carefully place it on its feet on the floor. Check everything, make sure it sits squarely on the floor and that all the joints have gone fully home. Check it for square with a witness stick or measure diagonally between corners. If something doesn't fit right, now is the time to take it apart and correct it. When you're satisfied that everything is as it should be, leave it clamped up and put it to one side.

One of the unusual features of this project is the lid hinges. I picked up the idea many years ago from Sam Maloof, a distinguished furniture maker in Los Angeles. It doesn't work in all situations, but where it does, it's a dandy. The parts of this hinge are T-nuts, machine screws, and copper tubing that I told you to get at the beginning. The figure to the left shows how they go together. But first you need to do some work on the machine screws and then position and drill the holes for the T-nuts. Cut off the heads on the screws and cut a slot for a screwdriver blade in that end. Put a point on the other end of the screws. If you have a lathe, you can do





this easily with a file and the point will be where it has to be, in the center of the screw body. Lacking a lathe you'll have to do it by hand in a vise or by chucking it in a drill press and using a file. Now thread the screw into the T-nut from the back side until the point almost comes through. Hold the T-nut in place in the rabbet on the top edge of the back frame with the top of the nut against the end frame as shown in the drawing on page 30. Turn the screw in the nut until the point makes a strong mark on the end frame. Do this on both end frames. Take everything apart and drill a $\frac{5}{16}$ " diameter hole through the frame right on that mark. Use a brad point bit so it doesn't wander off the mark. Do this on the drill press so you're sure that the hole is absolutely perpendicular to the face of the leg. That's as far as you need to go with the hinges right now.

Finally you can now shape the legs. The first step is to make the front and side templates. Full-size patterns are given in the PullOut™ Plans. Tape the side template on the outside edge of the leg blank with the straight edge of the template flush with the inside face, draw the shape and make the cut leaving the line. Do this with all four legs. Tape the face template to the face you have just cut with the straight edge of the template flush with the inside edge of the blank, draw the shape and make the cut leaving the line. Save the waste pieces you've cut off. They'll be the clamping pads when you glue up the frames and later the chest itself. They'll also be helpful in holding the legs in a vise while cleaning up the sawn faces. I've found that a spokeshave is by far the best tool to use for this procedure. Don't do any sanding now, that will come when you've glued up the frames. Reassemble each frame (without the panel) and scribe a line on each end of the lower stretcher to indicate the face of the matching leg. The upper stretcher should be very close to the

thickness of the upper part of the leg, so it shouldn't need any work at this time. However, if it's substantially thicker, now is the best time to trim it down to equal thickness. Disassemble the frame and notice the lines you've drawn on lower stretcher ends. They will probably have a slight curve to them, draw a straight line from the bottom to the top of this curve, set your table saw blade to the angle this line makes with the bottom edge of the stretcher, and cut away the waste wood. Now lay out and cut the curve on the bottom edge. Smooth this cut with a spokeshave. Dry assemble the frames with the panel and make sure everything fits and that you can blend the four frame parts together with sandpaper. If something is out of line, now's the time to fix it. When satisfied that all is as it should be, you can glue up the frames, but first I'd finish sand the panels. It's much easier to do this before they're in the frame. When you glue up the sides, don't put any glue on the panel edges or in the grooves. Don't put glue on the tenons or tenon shoulders. Put the glue on the upper half of the mortise and when the tenon goes home it'll wipe down over the rest of the mortise walls. When the glue has dried, sand the frames to smooth the joints and make all the parts blend together. Break all the open corners except those around the panel.

Final Assembly of Chest Body

Put the frames and bottom of the chest together dry as you did previously. This time, because the end frames are no longer flat and square it will be more difficult and you'll need some help. One trick I learned when clamping up a large unit with long clamps—tape the clamp pads in place with masking tape before you start. Pull the clamps up firmly and check everything to make sure it fits and is square. When you're satisfied, take it apart and apply the glue. The glue goes in



Transfer the leg patterns to cardboard and use as a template.

only two places, in the long mortises on the end frames and a very little bead in the corner between the tenon and the shoulder on the front and rear frames. Be careful: if you get too heavy a bead, it'll squirt out and you'll have a mess on your hands. The bottom is not glued in place—it floats in its grooves, thus accommodating expansion and contraction. Assemble the parts, apply the clamps and check for square. Use the stick method I mentioned earlier. If it isn't square make it so by adjusting the position and pressure of the various clamps. When the glue has dried, press the T-nuts into the holes you drilled for them in the end frames. The safest way to do this is to use a C-clamp. Put the fixed face of the clamp against the face of the nut and a pad under the movable face, then tighten the clamp until the nut is fully seated. This is a good time to install the tray rails. They're $\frac{1}{2}$ " X $\frac{3}{4}$ " X the length of the groove in the front and rear panels. Cut them to size, put a small amount of glue along the bottom of the grooves and press them into the groove.

The Lid

To get the length of the lid, measure between the faces of the T-nuts. To get the width, measure between the rabbets in the front and rear frames and add 1". Cut your lid panel to these measurements. On what will become the front edge of the upper face, cut a 1" wide by $\frac{3}{8}$ " deep rabbet. In the center of this layout the handle to fit the notch cut in the top of the front frame. The best way to get a straight edge on the front of the lid is on a table saw, rip the waste part of the rabbet from both ends to just short of the handle, then finish with a hand saw, files and sandpaper. Round over the front corners of the lid handles. Position the lid in the carcass and tighten the hinge pins to mark the center of the holes in the rear ends of the lid. It's important that these holes be positioned accurately and drilled perpendicular to the ends, so I suggest a drilling jig of some kind. When the holes are drilled, tap the $\frac{3}{4}$ " long pieces of $\frac{1}{4}$ " ID copper tubing into them. Now put a $\frac{3}{8}$ " radius on the back corners. Place the lid in position on the chest and see that it fits as it should. When it does, take the two headless machine screws and thread them into the T-nut from the outside. Screw them in until they bottom and your hinges are assembled. Install the lid support so that the lid opens a full 90°. The chest itself is now completed and ready for finishing.

The Trays

Refer to the figure on page 30 when making the trays. Make the sides and ends from $\frac{3}{8}$ "-thick stock. The corners are put together with through-dovetails. You can do these with a router and a jig, but in my opinion that gives the work a mechanical look which really doesn't go with the rest of this project. The joints shown in the drawing are such as a skilled craftsman would employ and they complement the work you have already done. It's the same with the bottoms. You could use plywood, but I wouldn't. It detracts from the quality of the entire chest. Glue up $\frac{5}{16}$ " thick panels of the proper size from the same wood you've used in the chest. Dado the edges to fit the through-dadoes in the sides and stopped-dadoes in the ends. The overall dimensions I've given for the trays are nominal, get the exact measurements from the chest you've just completed. Allow about a $\frac{1}{4}$ " clearance in the width and $\frac{1}{2}$ " to $\frac{3}{4}$ " clearance in the length of the two trays together. The upper edge of the tray ends can come within $\frac{1}{8}$ " of the underside of the lid.

Finishing

I said at the beginning of this story that I believed in letting the wood provide the beauty in the piece. I suggested that you spend whatever time it would take just to find the right wood for each part. To make this vision come true and the effort pay off, the finish must be natural—no stain. If you've found a particularly fine grain pattern, stain will invariably muddy it and spoil the picture you have created.

I have never used a brush-on varnish for finishing. This is not because I have anything against a low-gloss varnish finish. It's because I'm a lousy painter and have never been able to flow on a coat of varnish so that there were no streaks or runs. For this reason, early on I gravitated to the brush-on and rub-out type of finish.

Several coats of Formby's Tung Oil Finish will do a very fine job. If getting the finish sheen you want takes too many coats, you can take a short cut. After the first two or three, apply a coat or two of paste wax. Be sure it's paste and not liquid or spray, they're apt to contain water and will ruin your finish. A friend of mine who specializes in refinishing high-quality antiques told me to use Trewax. I found that it does an excellent job. **PW**

This hope chest was finished by Mark Johnson at The Top Coat in Oakland, California.



Deck Furniture

A Popular Woodworking Project



Hugh Williamson's unique design style gives this patio ensemble a cohesive feel. The construction of the deck chair, child's deck chair and deck table is simple and sturdy. Make multiple chairs and tables for a complete deck set that fits your family's needs.

by Hugh F. Williamson

This deck chair is made from standard lumber sizes and readily available hardware. All of the joints are made with a router or miter saw. With accurate setups, multiple pieces can be made simultaneously, making it possible to create an entire deck set in no time.

Legs and Arms

Cut the leg (A) and arm (B) blanks to the dimensions given in the Cutting List. Mark the shape of each as shown in the Side View figure and cut the profiles on the bandsaw. Sand each edge smooth and check that the legs and arms butt correctly.

The angled ends of the arms and legs are joined with splines. Cut the grooves for the splines with a $\frac{1}{4}$ " diameter straight bit set to a depth of $\frac{1}{2}$ " in the

table mounted router. Use a fence on the router table and rout the through-grooves centered in each joining edge. Make the splines from $\frac{1}{4}$ " X 1" tempered hardboard. Use epoxy or waterproof wood glue to assemble the arms and legs with the splines. These joints are reinforced with screws driven through the arms and splines into the legs. Drill and counter bore pilot holes centered 1" from the joint and at an angle parallel to the receiving leg as shown in the Side View figure. Drive #8 X 3" FH deck screws into the holes so the heads sit $\frac{1}{4}$ " below the surface. Cover the screw heads with a wood plug cut from redwood scrap.

After the leg/arm assemblies are dry, rout $\frac{3}{8}$ " deep recesses on the inside of each one to receive the seat sides as dimensioned and located in the Side View figure. Use a straight cutting bit and guide fences to rout out these grooves.



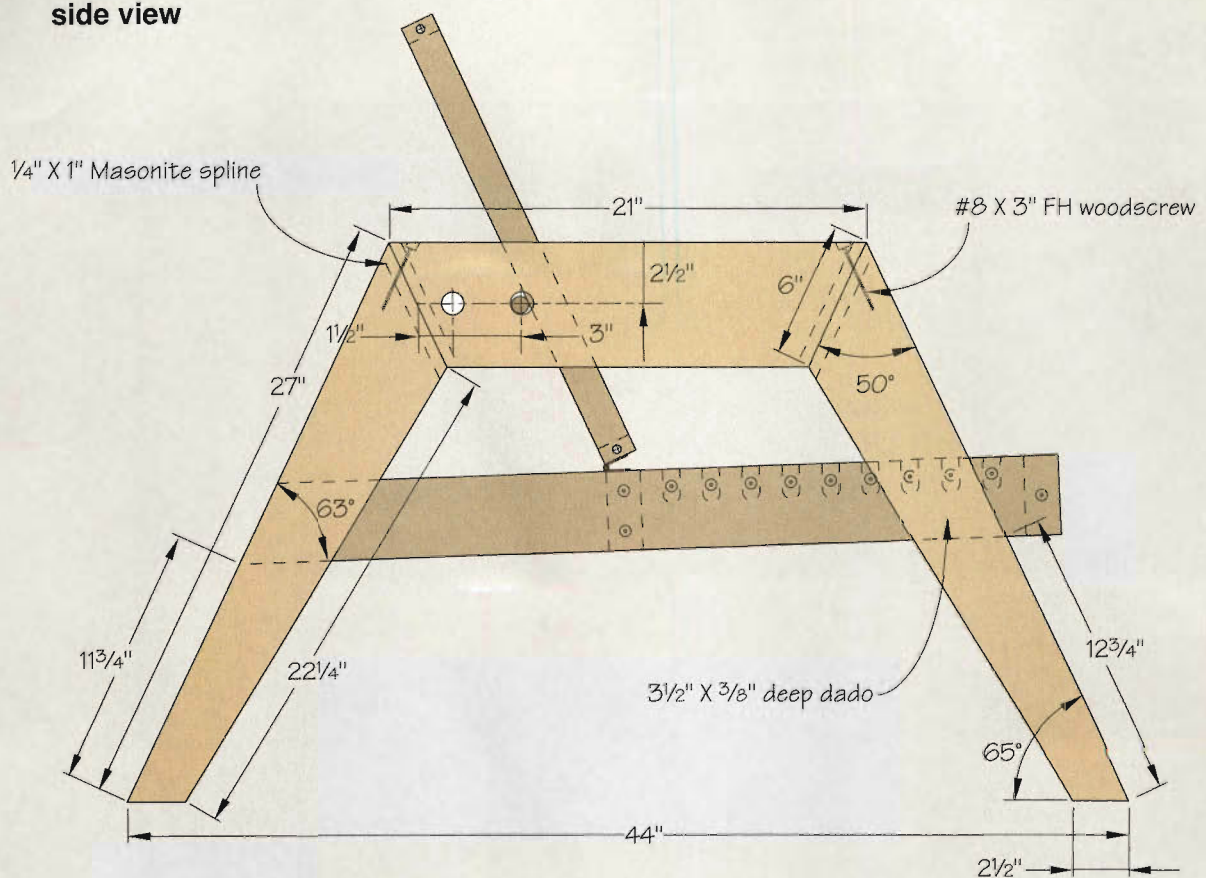
Cut the arm/leg spline grooves with a $\frac{1}{4}$ " straight bit set to a depth of $\frac{1}{2}$ ".



Use guides on either side of the router to cut the seat support dadoes in the legs.

Hugh F. Williamson is a woodworker in Tucson, Arizona.

side view



Seat

Cut the seat ribs (C), the seat sides (D), the seat front (E) and the seat back (F) to the dimensions given in the Cutting List. Use a miter box to cut 45° miters on the front end of each seat side and on each end of the seat front as shown in the Seat figure. Make a 63° cut on the back end of each seat side as shown in the Side View figure.

The seat ribs and back are joined to the sides with nine stopped-dadoes for the seat ribs and one through-dado for the seat back. To rout the stopped dadoes, first clamp the two seat sides to your bench so that their top edges are butted and their ends align. Mark the locations of the 3/4\" X 1 1/2\" X 1/2\" deep stopped dadoes as located in the Seat figure. Install a 3/4\" straight cutting bit set to a depth of 1/2\" in the router, set up a router frame-guide and rout the seat rib dadoes as shown in the photo. Use a straight bit in the router or a dado head on the table saw to cut the 1 1/2\" X 3/4\" deep through-dadoes for the

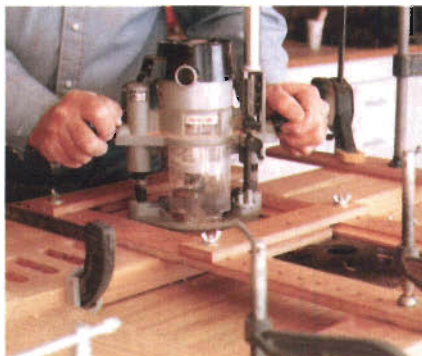
seat back as located in the Seat figure. If you're planning on making multiple chairs, it's helpful to make the more elaborate jig for routing multiple dadoes as shown in *Popular Woodworking* issue #60, page 38.

Use a 3/4\" diameter roundover bit to radius the bottom edge of the seat ribs so that they set nicely in the curve left by the router bit in the stopped dadoes in the seat sides.

The seat ribs, back and front are secured to the seat sides with water-proof glue and #8 X 2\" FH wood

screws. On the drill press, drill a pilot hole centered in each stopped dado in the seat sides, two in each through-dado and one at the front of each seat side centered on the miter as shown in the Side View figure. On the outside of each seat side use a 1/2\" Forstner bit in the drill press to counterbore the screw holes to receive 1/2\" diameter plugs.

Dry assemble the seat to check for a snug and square fit. Glue and screw the assembly together and let it dry. Cut 1/4\" X 1/2\" diameter plugs and glue them in place in the seat sides.



Cut the stopped dadoes in both seat sides at the same time with a router guide.

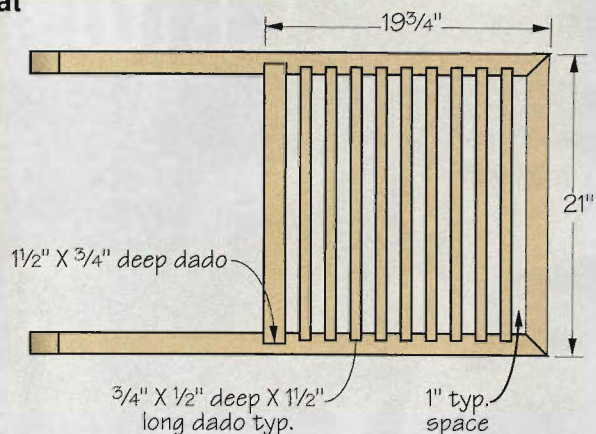


Round over the bottom of the seat ribs to fit correctly in the stopped dadoes.

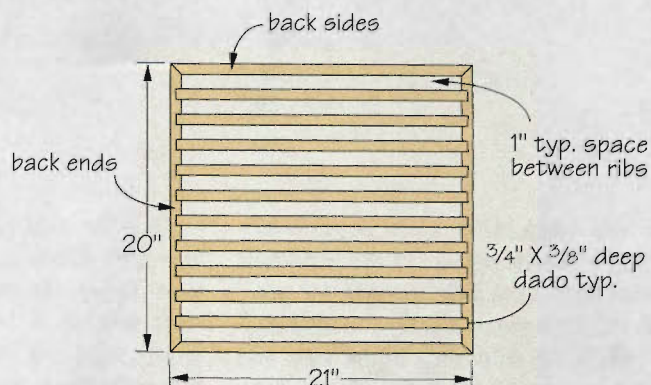
Redwood Deck Chair					
Cutting List					
Qty	Part	Finished Size			Piece
		T	W	L	
4	A	2	6	27"	legs
2	B	2	6	21"	arms
9	C	1	2	19"	seat ribs
2	D	2	4	36"	seat sides
1	E	2	4	21"	seat front
1	F	2	4	19½"	seat back
10	G	1	2	20¼"	back ribs
2	H	1	2	21"	back sides
2	I	1	2	20"	back ends
1	J	¾" diam		25"	support dowel

Measurements without inch marks are nominal sizes.

seat



back



Back

Cut the back ribs (G), sides (H) and ends (I) to the dimensions given in the Cutting List. Cut 45° miters on each end of the back's sides and ends as shown in the Back figure. Use a router and guide fences to cut the through-dadoes in the ends to receive the ribs. Mark the dadoes as located in the Back figure. Use a ¾" diameter straight bit set ⅜" deep to cut the dadoes. Assemble the back using glue and #8 X 2" FH woodscrews to secure the back ribs and the mitered corners.



Use a ½" forstner bit to cut the holes for the screw plugs.

Assembly and Finishing

Secure the seat and back to your bench and round over all edges with your router using a bearing equipped ⅜" diameter round over bit. Fill defects with waterproof glue mixed with fine redwood saw dust so no moisture can be trapped. Finish sand the leg/arm, seat and back assemblies.

Assemble the legs to the seat as shown in the Side View figure. Use glue at the front joints and glue and two #8 X 3" FH woodscrews countersunk from the inside of each rear seat/leg joint.



Use a pair of router guides to cut the dadoes in both back ends at once.

Attach the back to the seat with a 19" long brass piano hinge (Woodworker's Supply, Tel. 800 645-9292) and #6 X ¾" FH woodscrews. Use a 1" spade bit to cut two holes in each arm, as located in the Side View figure, to receive the back support dowel. Insert the cherry support dowel (J) into the holes and test the tilt. Finish the chair with a mixture of two parts boiled linseed oil with one part water sealer. Commercially available cushions vary in size and are available from most home and garden stores.



Child's Deck Chair



Child's Deck Chair					
Cutting List					
Qty	Part	Finished Size			Piece
		T	W	L	
4	A	1	4	15"	legs
2	B	1	4	9 ³ / ₄ "	arms
9	C	1	2	11 ¹ / ₄ "	seat ribs
2	D	1	2	11 ³ / ₄ "	seat sides
10	E	1	2	11 ¹ / ₄ "	back ribs
2	F	1	2	14 ¹ / ₄ "	back sides

Measurements without inch marks are nominal sizes.

The basic construction of the child's deck chair is similar to the standard deck chair. One inch nominal (³/₄" actual) redwood stock is used throughout.

Note the difference in the seat and back construction in the child's deck chair from the standard chair. The ribs form the seat and back ends and are joined to the seat and back sides with through-dadoes.

Cut the leg and arm blanks (A and B) to the dimensions given in the Cutting List. With the bandsaw, cut the pieces to final shape as dimensioned in the Side View figure. Smooth all edges and connect the legs to the arms with ¹/₄" X ³/₄" hardboard splines.

Cut the seat and back pieces (C – F) to the dimensions given in the Cutting List. Cut the dadoes in the seat and back sides with a ³/₄" straight bit in your router as dimensioned in the Side View figure. Glue the ribs in place with waterproof glue. Drive and countersink two #6 X ³/₄" screws into the end of each of the four end ribs for extra stability.

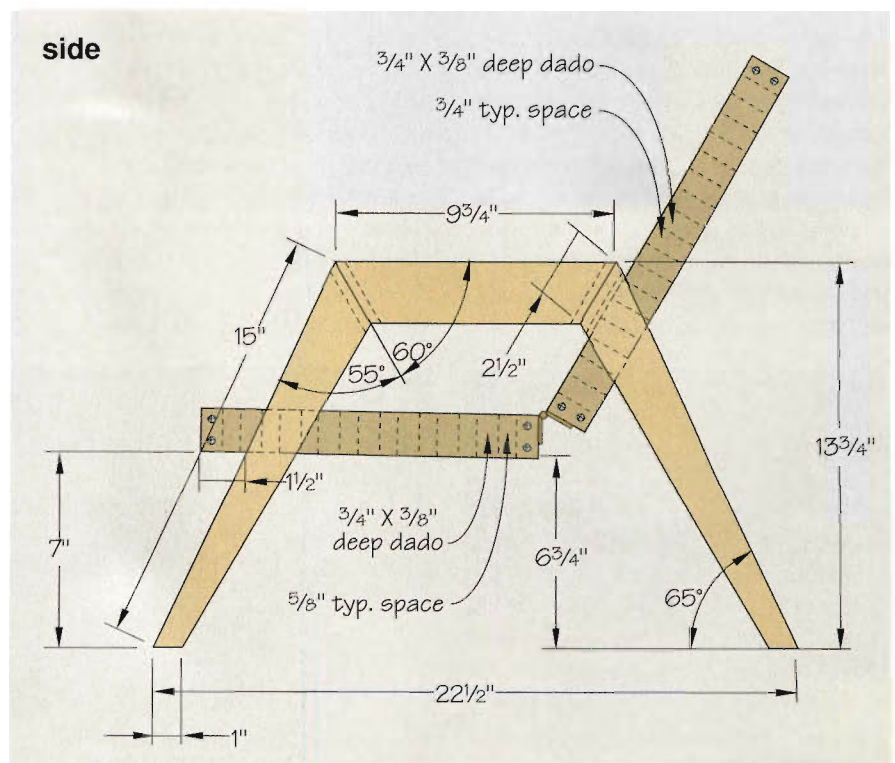
Round over all edges on the three assemblies with a ³/₈" roundover bit in the router. Finish sand the pieces through 220-grit sandpaper.

Although the back does not move, I find it easiest to connect the back and seat with a piano hinge and #6 X ¹/₂" FH woodscrews. The piano hinge is easily cut with a hack saw and the sawn edges smoothed with a file.

Glue the seat/back assembly to the legs with epoxy as shown in the Side View figure. Reinforce these connections with #6 X 1¹/₄" FH woodscrews driven from the inside with a ratchet and screwdriver attachment. Finish with two parts boiled linseed oil and one part waterseal. Your local upholsterer should be able to make a comfortable cushion to fit the child's deck chair from scrap material in their shop.



Use a small socket with a Phillips driver to drive the screws located between ribs.



Deck Table



Deck Table					
Cutting List					
Qty	Part	Finished Size			Piece
		T	W	L	
23	A	1	2	15"	top ribs
2	B	1	4	30 ³ / ₄ "	top sides
2	C	1	4	16"	top ends
4	D	2	2	18"	legs

Measurements without inch marks are nominal sizes.

A small, low table on your patio or deck will nicely complement your deck chairs and hold your coffee or iced tea within convenient reach.

The construction of the table top is very similar to that of the deck chair seat. Cut the ribs (A), sides (B) and ends (C) to the dimensions given in the Cutting List. Cut 45° miters in each end of the sides and ends as shown in the Top View figure. With a straight cutting bit in your router, cut $\frac{3}{4}$ " X $1\frac{1}{2}$ " X $\frac{1}{4}$ " deep stopped dados as located in the Top View figure. Refer to the deck chair instructions for a detailed description of this process. Use a $\frac{3}{4}$ " roundover bit with a guide bearing to radius the bottom edge of the ribs so they fit into the stopped dados. Secure the top ribs, sides and ends with waterproof glue and #8 X 2" FH woodscrews. On the drill press, drill one pilot hole centered in each stopped dado and two centered at each mitered corner. Counterbore each of the holes from the outside $\frac{1}{4}$ " X $\frac{1}{2}$ " diameter to receive plugs cut from redwood scrap. Glue and screw the top assembly together. Round over all edges with a $\frac{3}{8}$ " bearing guided roundover bit in your router.

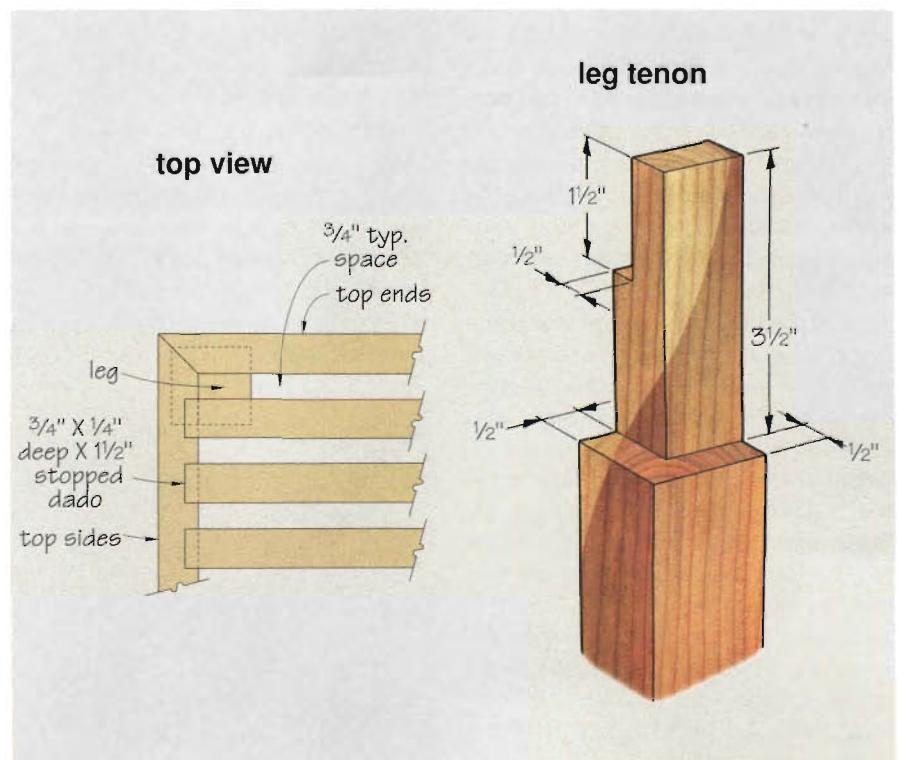
Cut the legs to the dimensions given in the Cutting List. The legs have an interlocking tenon that fits between the frame and the end rib. Cut the tenon on the bandsaw as shown in the Leg Tenon figure and sand to fit.

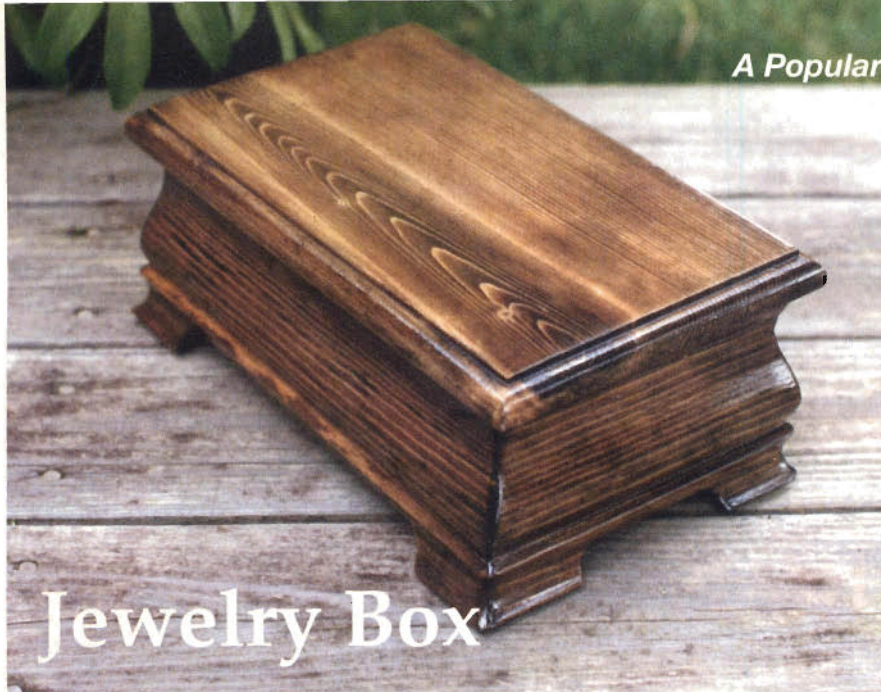
Remember that two of the legs will be reversed for the opposing side. Each leg is glued in place with epoxy and held with three #8 X 2" screws—two through the top side and one through the top end. Countersink and plug the leg attachment screws.

Sand the table through 220-grit sandpaper and finish with a mixture of two parts boiled linseed oil and one part waterseal. **PW**



Remember that the tenons on adjacent legs are mirror images of each other.





Jewelry Box

by Robert L. Elmore

Here's a quick and easy little gift project that will delight the recipient and make you look like a workshop wizard. The sides and ends of this jewelry box are made from about 48" of common crown molding that's available at any home building supply center. The top and bottom are made from stock that's probably hiding in your scrap box.

Begin by cutting the sides (A) and ends (B) to length as given in the Cutting List. Make all your measurements on the flat or back side. Tilt the blade on the table saw to 7° and cut the top 1/4" from each side and end piece so that when the case is assembled the top edges are flat. Make these cuts with the flat side of the molding pieces facing down. Layout the feet on the ends and sides as shown in the End View figure and cut away the waste with a jig saw or bandsaw.

Now, set up the table saw with the blade tilted 45° and the miter fence set at 7°. Use stop blocks on the fence to make certain each pair of sides and ends are identical and that the overall length is not reduced—be careful not to over cut. All cuts, both left and right, are made with this single setup. Sand the inside surfaces of all four pieces through 150-grit.

Spread an even coat of glue on the mitered surfaces and place the sides and ends together. Clamp the case

together with a heavy cotton cord—make a loop in one end and wrap it around the glued assembly. Gradually tighten the wrapping until you have about six complete wraps. Don't pull too tightly. Compare measurements of diagonal corners to check for square, make any adjustments, then tie off the cord and set the case aside to dry.

Cut the top (C) to size as given in the Cutting List. Route a decorative edge around the top piece with an ogee bit. Sand the top through to 220-grit. Cut the bottom (D) to size then recut all four sides of the bottom with the table saw blade tilted 7°. Be careful not to reduce the overall dimensions of the bottom. Sand the bottom through 220-grit.

When the case is dry, remove the string and sand it through 220-grit. Now, turn the case upside down and drop the bottom into place. Press it into position with light finger pressure, making sure that it is seated level. Mark its position with a sharp pencil then

remove it from the case. Apply glue to the beveled edges of the bottom only and reseat it to the penciled markings. Clean off any glue squeeze out. When the bottom is dry, turn the box right-side-up and lightly sand the top edges to a perfectly flat surface. Check it with the lid to achieve the best fit possible.

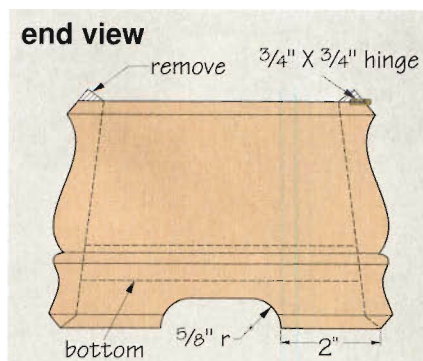
I know you've already sanded all the parts, but while pine is inexpensive and easy to work with, it is a difficult wood to properly finish. If there is any doubt about the quality of your sanding job, now is the time to sand again with 220-grit paper.

When you're satisfied with the smoothness, turn the top upside-down on the bench and place the box in position on the bottom surface of the lid. Align it evenly around all four sides and lightly mark the position with a pencil.

Lay out the locations for the two 3/4" X 3/4" hinges and cut mortises in the top and back to receive them. The hinge pin falls 1/8" outside the case. This allows the lid to stand upright when the box is opened.

Use a pure tung oil finish, or apply your stain of choice—dark walnut looks great. Follow with four or five coats of high gloss polyurethane or varnish. Use fine (0000) steel wool between coats for the best finish. If you use tung oil, follow the manufacturers application instructions. Line the inside of the box with flocking or peel and stick felt—both are available at hobby stores.

You could finish off the project by dropping in the Hope Diamond or the Star of India. With or without the finest jewels, it's guaranteed to please—a beautiful gift made with your own hands for someone very special. [PW]



Jewelry Box

Cutting List

Qty	Prt	Finished Size			Piece
		T	W	L	
2	A	3/4" crown moulding	12"		sides
2	B	3/4" crown moulding	7 1/8"		ends
1	C	3/4"	7 3/16"	12"	top
1	D	3/4"	5 7/8"	10 1/16"	bottom

Robert L. Elmore is a woodworker in Richmond Hill, Georgia.

Popular Woodworking No. 80

September 1994 (pages 39-54)

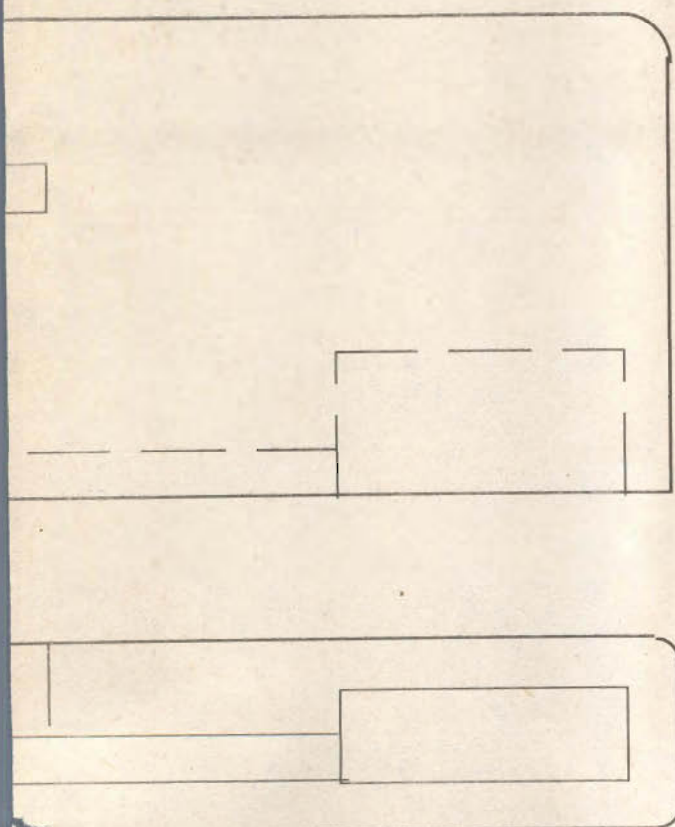
PullOut™ Plans

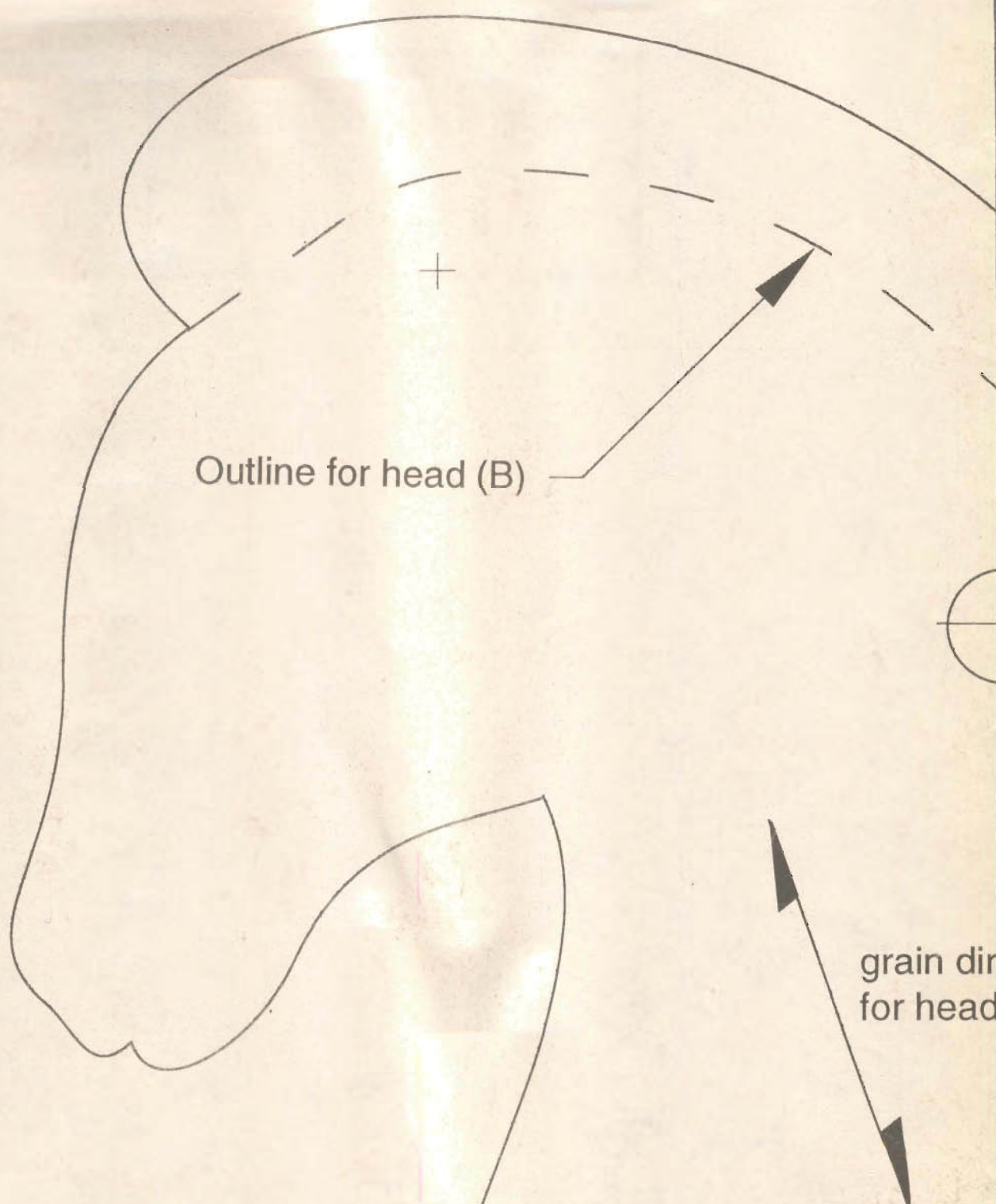


39

48

Rodeo Rider
pattern





40

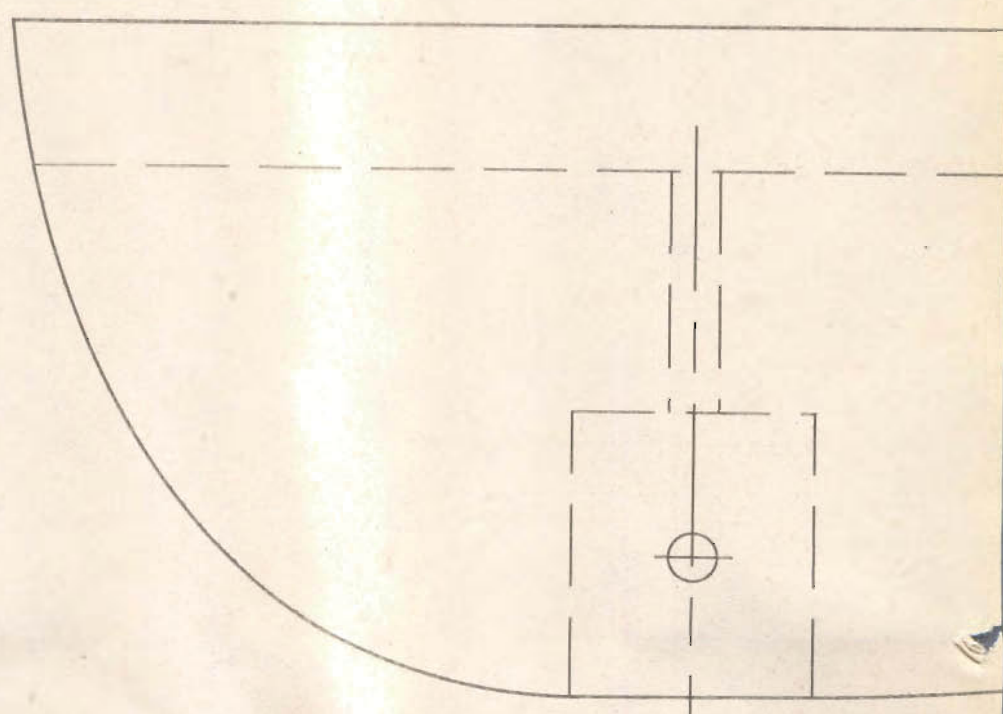
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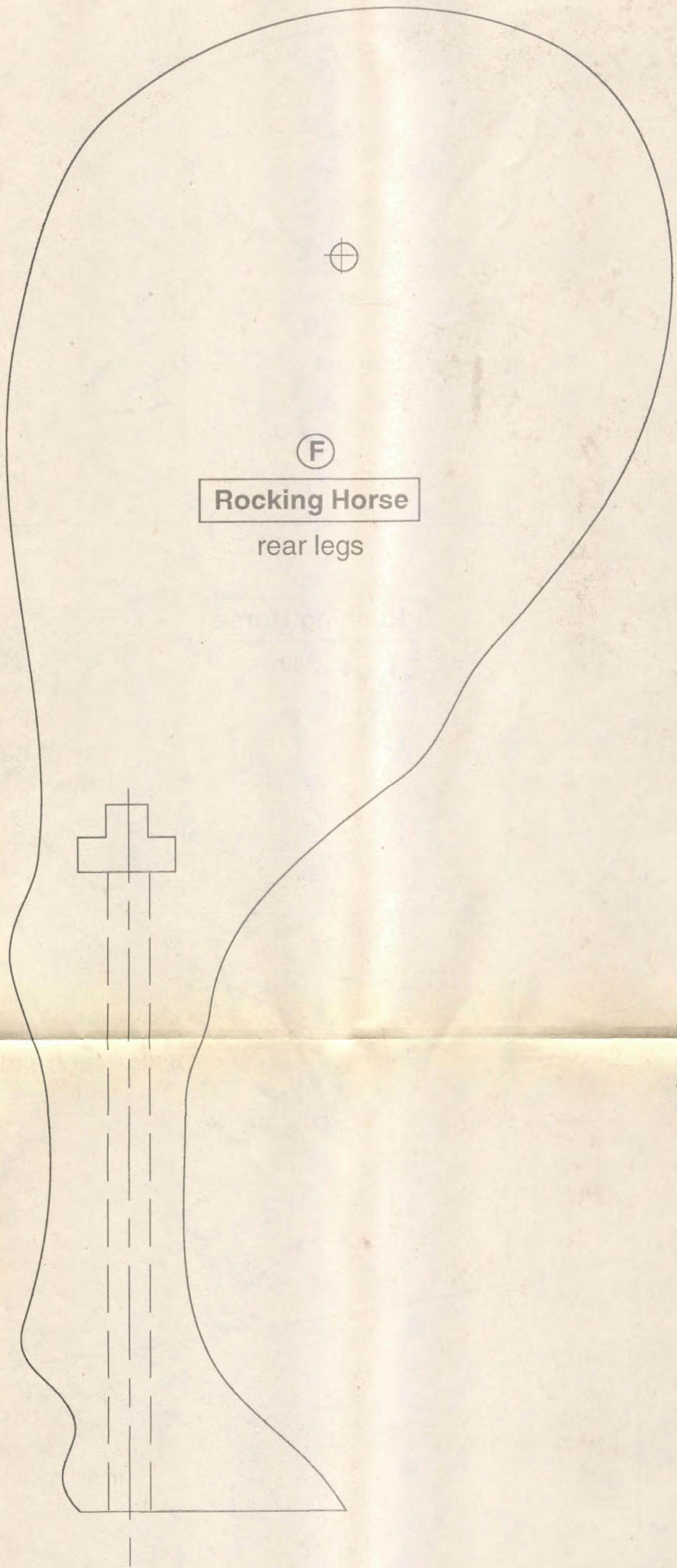
Outline for head (B)

Rocking Ho

(A)

head/main h





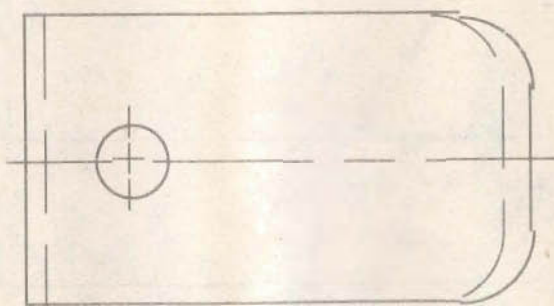
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Rocking Horse

rear legs

41

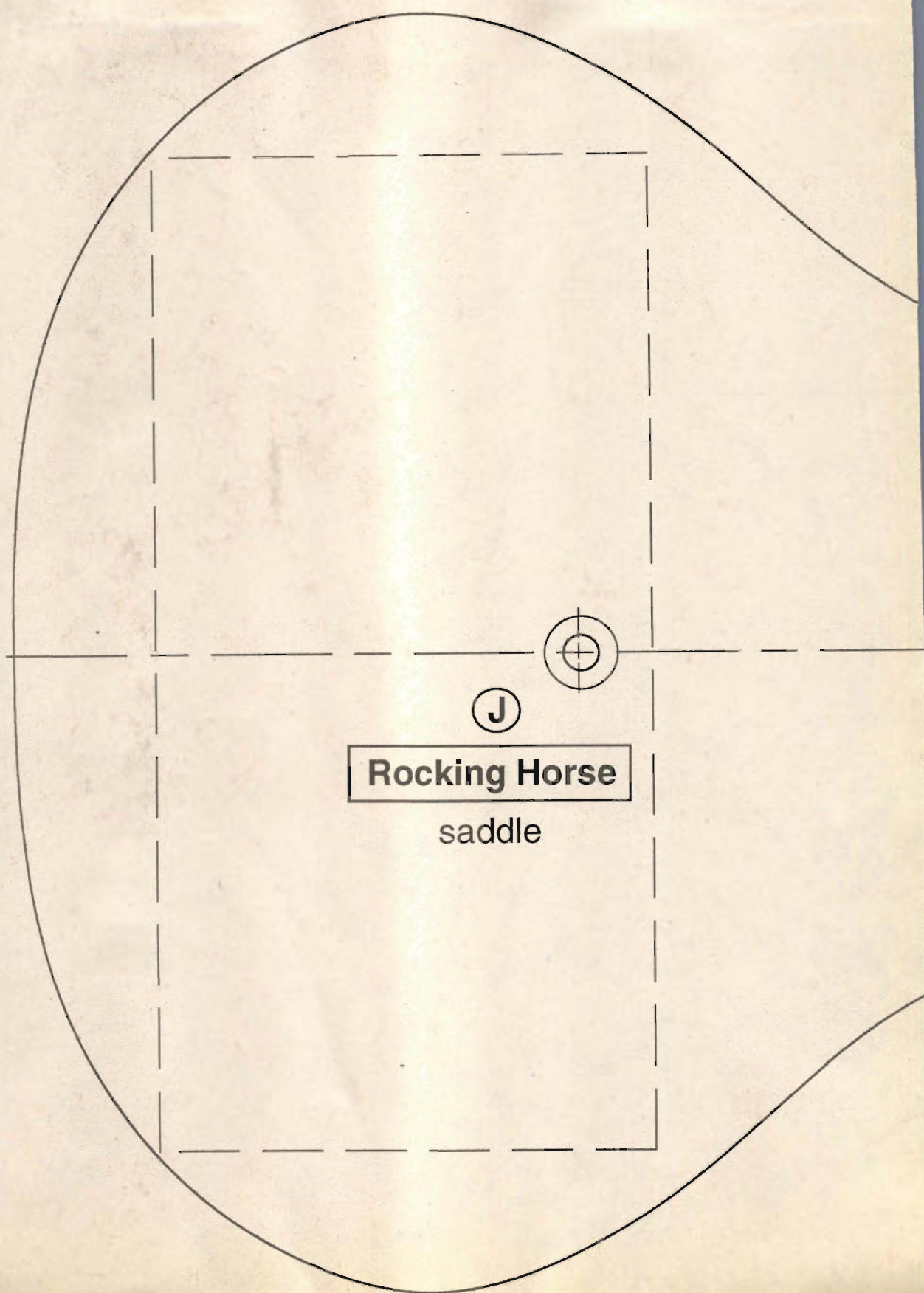
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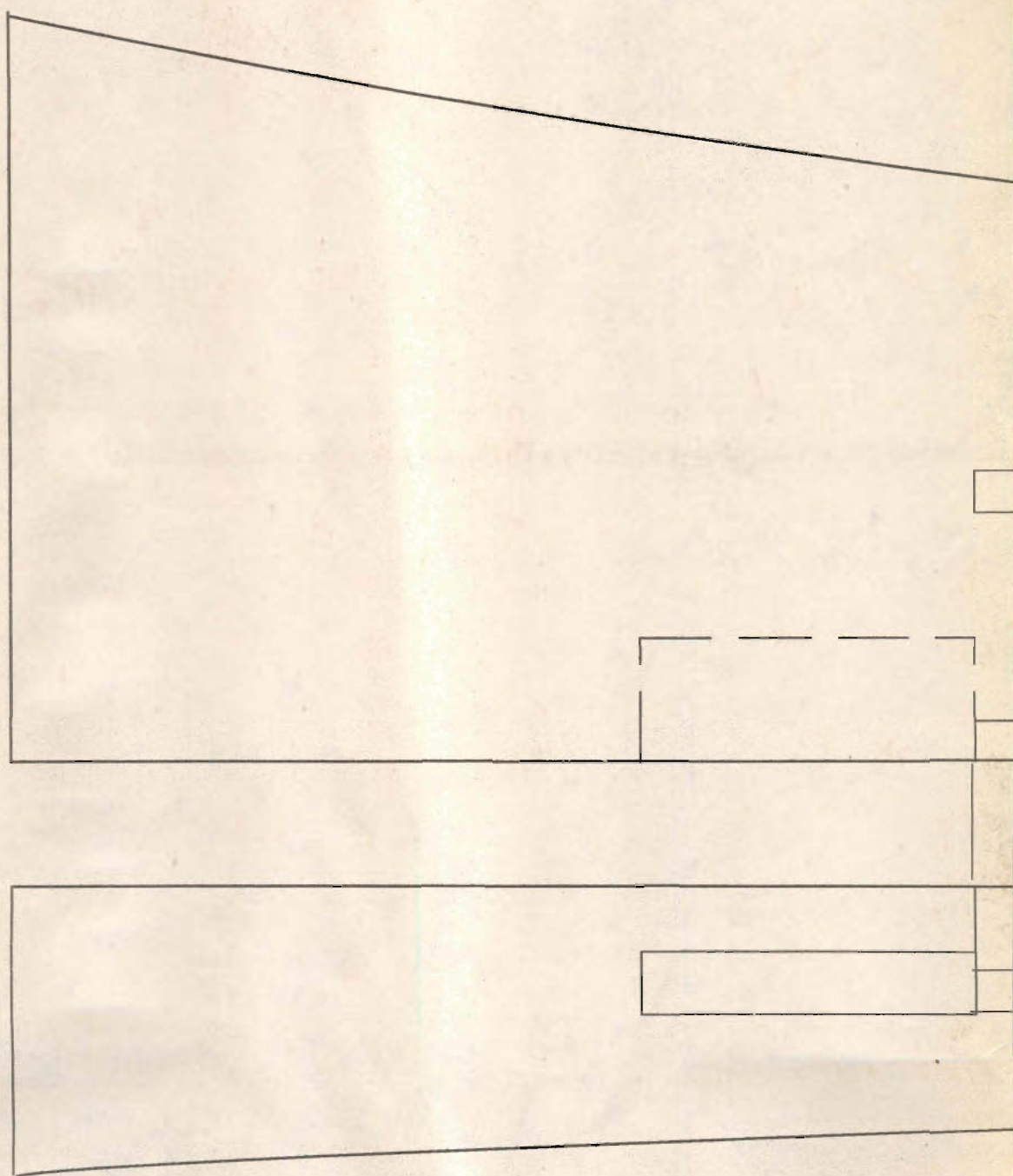
Rocking Horse

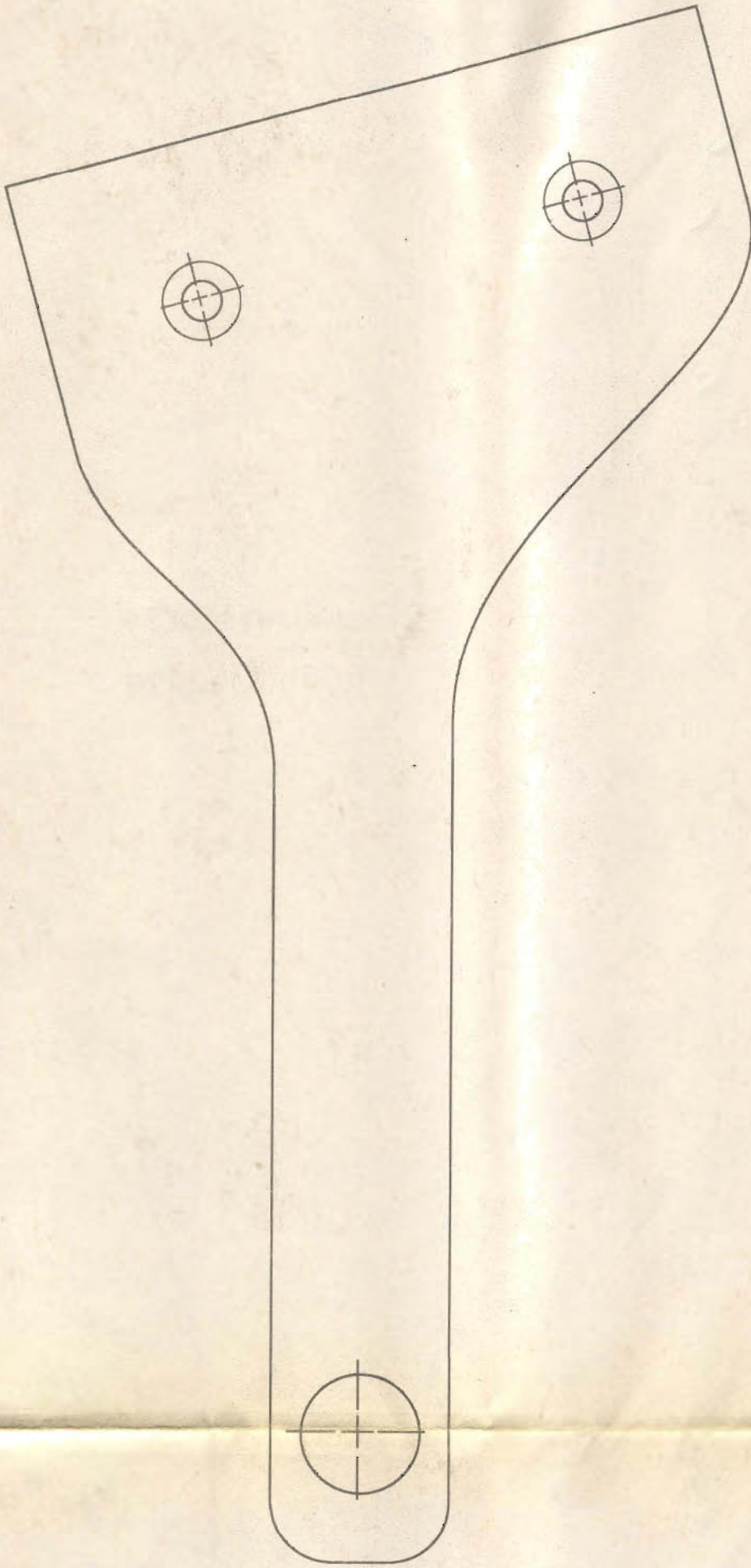
rear shoes



42

43





54

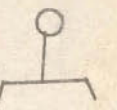
47

(K)

Rocking Horse

stirrups

XIT

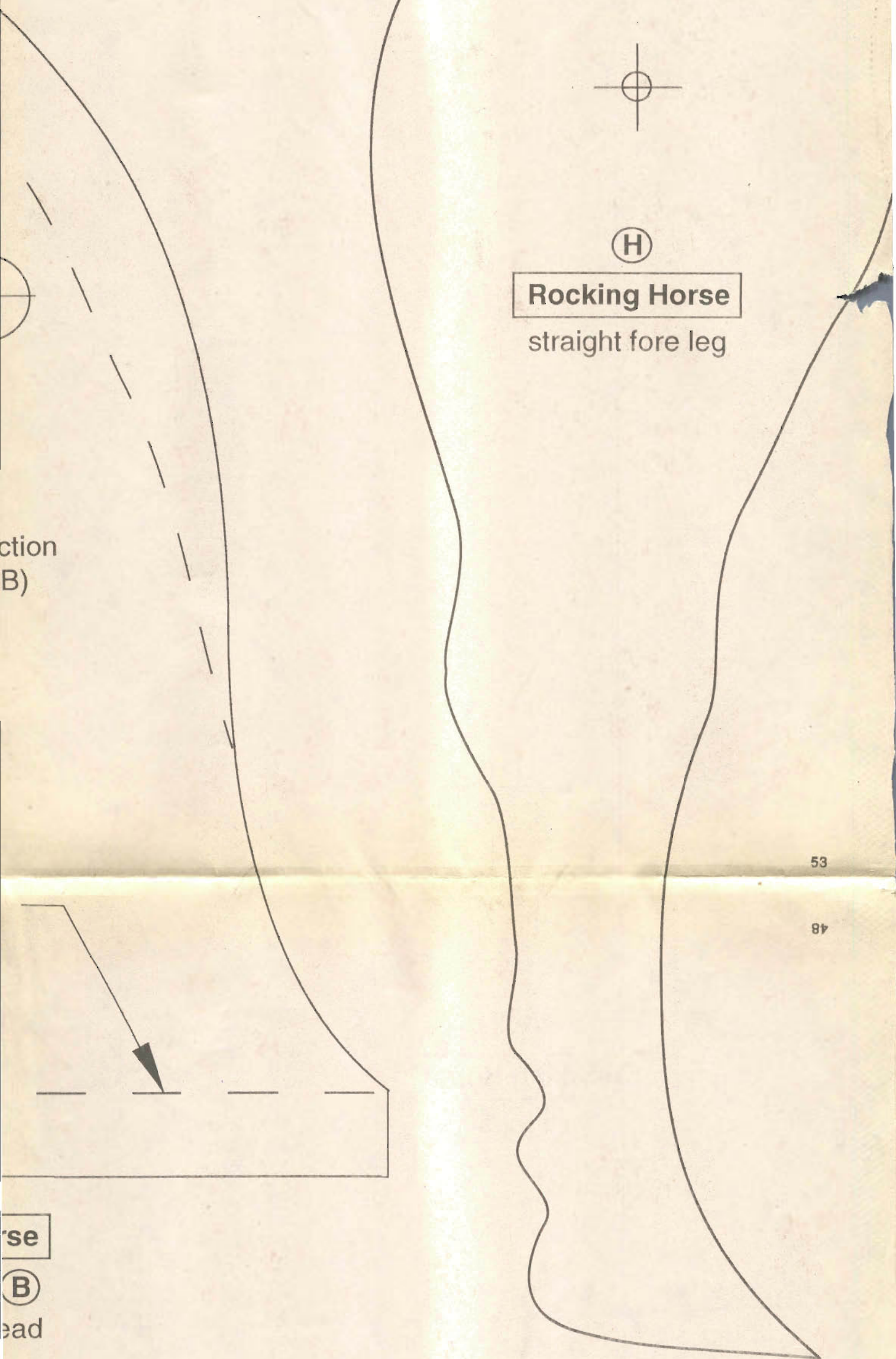


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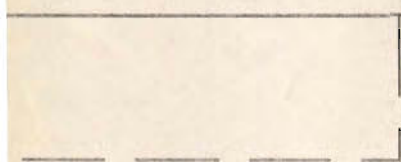
Rocking Horse
straight fore leg

53

48

ction
(B)

se
Ⓜ
ead



Ⓜ

Rocking Horse
body



①

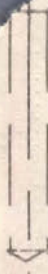
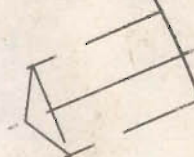
Rocking Horse

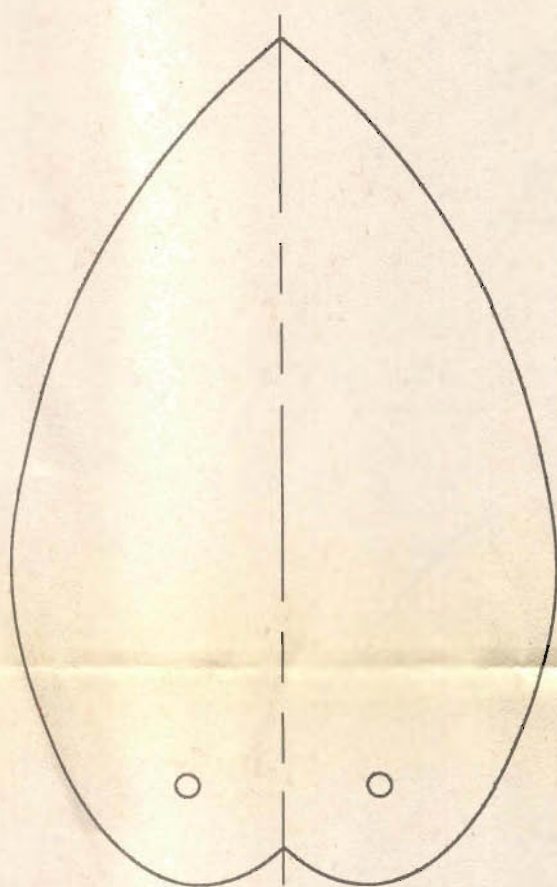
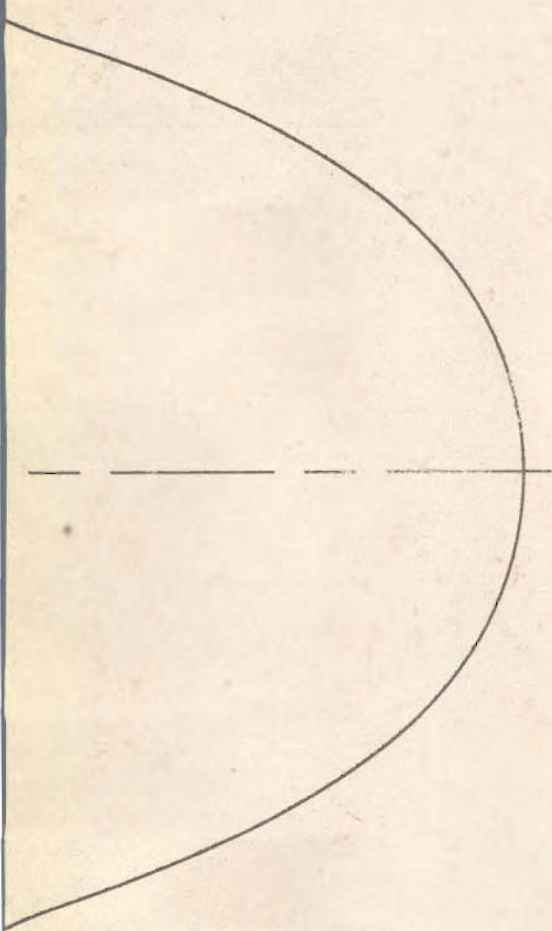
bent fore leg

52

49

Carefully open staples to remove plans, then bend them closed again.





Rocking Horse

ear

51

09

A Holder o
leg

Cantilevered Rocking Horse



by Howard French

This beautiful thoroughbred will delight all the little buckaroos, from toddlers to the kindergarten set. He is strong, but gentle, easy to mount, and tireless at any gait.

The rocking horse is constructed entirely from standard, readily available materials and hardware. The head assembly, body, front legs, saddle and stirrups are made from fir. I made the rear legs, rockers and cross brace from oak. The prototype was cut out with a hand-held jigsaw; however, a band saw will make the project easier and faster to complete, especially if a stable of horses is anticipated. In this latter

Howard French is the author of Gifts from Grandpa's Workshop (Tab Books, Blue Ridge Summit, PA).

instance it is advisable to make accurate, durable pattern pieces for the several components.

Transfer the full-size patterns from the PullOut™ Plans onto pieces of suitable pattern material (heavy paper, cardboard, Masonite, panel stock, etc.) large enough for each of the pieces (A, B, D, F, G, H, I, J and K). If you're only going to build just one horse, plain paper patterns will suffice. Attach them to your stock with double-stick tape or spray adhesive and carefully observe the indicated grain direction. Where two of the same components are required use the first piece as a pattern for the second. Cut to the outside of the lines, then sand the pieces to match each other.

Laminate the horse's head from three thicknesses of $\frac{3}{4}$ "



Note the different grain orientation on the individual head/mane pieces—the mane is vertical, the head is rotated forward 20°.



The sole weight of the rider is supported by the cross brace. Make sure this piece is tight-grained and free of defects.

material. The head/mane (A) is sandwiched between the two head pieces (B), as shown above. Rotate the grain of the two head pieces 20° forward—the grain of the head/mane piece is vertical. Choose the best sides of the head pieces to face out and rout a $\frac{3}{8}$ " radius around the outside edges—except for their straight (bottom) edges. Rout the same radius on both edges of the mane portion of the head/mane piece. Carefully align, glue and clamp these components together. The bottom edge of the head/mane piece extends below the head pieces to form a $\frac{3}{4}$ " X $\frac{3}{4}$ " X $7\frac{1}{4}$ " long tenon. Drill a $\frac{3}{4}$ " diameter hole for the reins (C) at the location shown on the pattern.

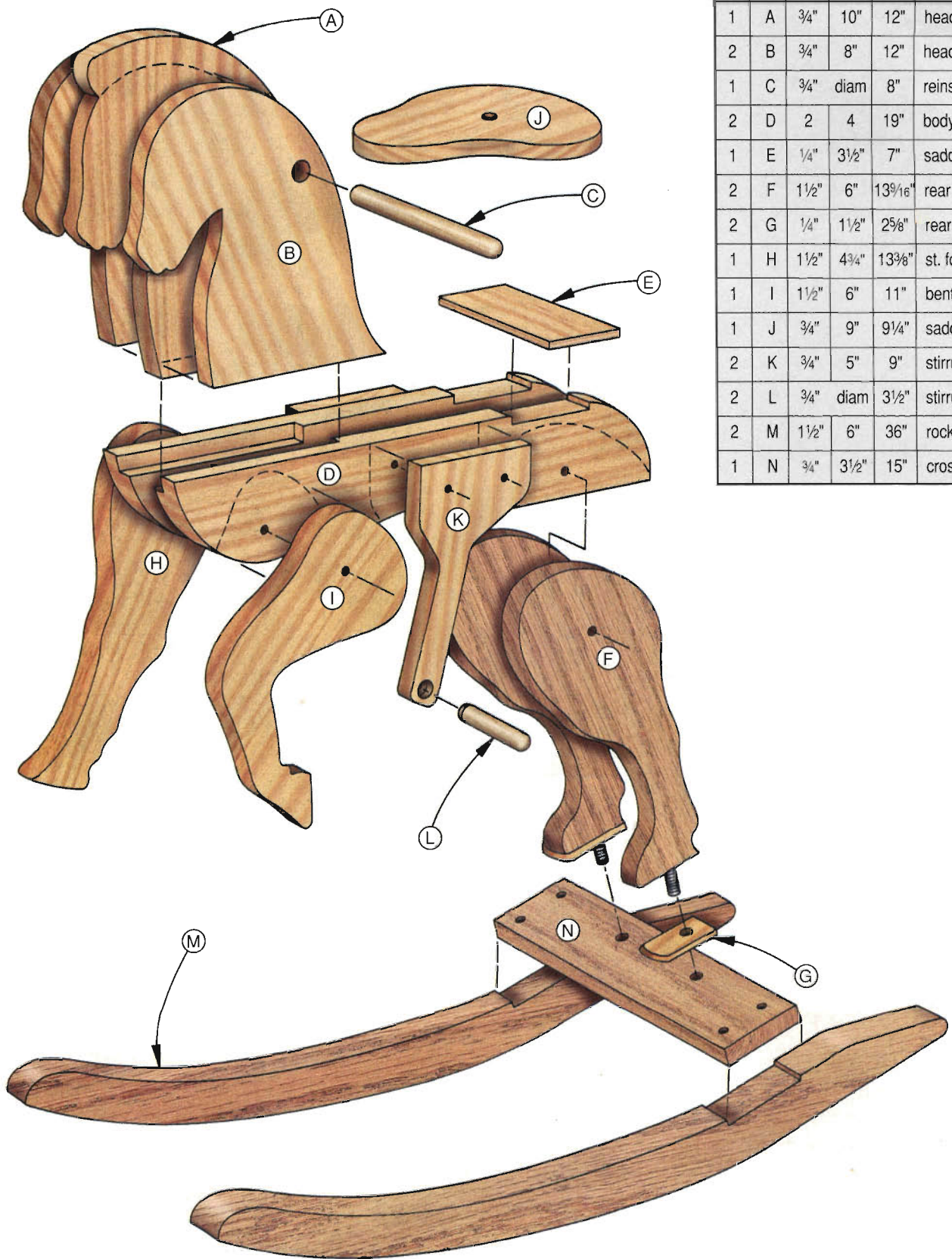
Cut two body pieces (D) from clear 2 X 4 stock. Glue these pieces together, with the best surface facing out. Sand the front, rear and belly radii flush after the glue has dried. Rout a $\frac{3}{4}$ " X $\frac{3}{4}$ " X $7\frac{1}{4}$ " long mortise along the top, front centerline of the body to accommodate the tenon portion of the head assembly. Make a $3\frac{1}{2}$ " X $\frac{1}{4}$ " deep cut across the top rear area of the body to accommodate the saddle batten piece (E).

Locate and drill the pilot hole for the saddle retaining screw. Turn the laminated body over, then mark and cut the two $\frac{7}{8}$ " X $1\frac{3}{16}$ " X $1\frac{1}{2}$ " deep mortises for the leg attaching nuts and washers as located on the full-size pattern. Locate and drill the $\frac{1}{4}$ " diameter holes for the leg attachment bolts, and for the $\frac{1}{4}$ " lag screw that retains the head assembly. Locate and drill the pilot holes for the stirrup attaching screws. Rout a $\frac{3}{8}$ " radius for $8\frac{1}{4}$ " along the upper, front corners of the body, and along the curved portion of the belly area. Use a $\frac{1}{2}$ " Forstner bit and drill a $\frac{3}{4}$ " deep hole on the body centerline, in the curve of the rump, to receive the horse's tail.

I made the rear legs (F) from oak for added strength. Align the pattern so the wood grain is parallel to the centerline of the deep, $\frac{3}{8}$ " diameter hole, and perpendicular to the plane of the hoof. Choose the better surfaces for the outside, then rout a $\frac{3}{8}$ " radius on the outside edges, except for the bottom of the hooves. Radius the inside edges in a like manner below the area where they attach to the body. Scribe pencil lines on the inside and rear edges of the hind legs to align the $\frac{3}{8}$ " holes for the mounting bolts. Drill the holes to the depth shown on the full-size pattern. On the inside surface of each leg, cut a mortise near the top of each hole to accommodate a $\frac{3}{8}$ " hex nut. Insert a $7\frac{7}{8}$ " length of $\frac{3}{8}$ " threaded rod up through the leg and into a hex nut inserted into the mortise. Tighten the rod in place so that the upper end bottoms out in the hole. Mix wood glue and clean saw dust to a pasty consistency and pack it around the embedded nuts, filling the mortises.

Cut out a slightly oversize pair of shoes (G) from oak stock. Mark and drill a $\frac{3}{8}$ " diameter hole through each shoe to fit over the mounting bolt as shown in the PullOut™ plans. Apply wood glue to the bottom of the hooves, allowing it to follow the threaded rods into the $\frac{3}{8}$ " holes. Glue and finish nail the shoes securely in place. Sand the hooves and shoes to shape with a disk or belt sander.

Make the straight foreleg (H) in the same way as the hind legs, except it doesn't have a bolt or shoe. Laminate the bent foreleg (I) from two thicknesses of $\frac{3}{4}$ " material. Lay out the patterns so the grain in the woods is rotated 20° from each other. Glue and clamp the two pieces together securely. Sand the edges to shape, then rout a $\frac{3}{8}$ " radius on the edges except the bottom surface of the hoof. Drill $\frac{1}{4}$ " diameter holes for the attaching carriage bolts in each front leg as shown in the full-size patterns.



Cantilevered Rocking Horse

Cutting List

Qty	Prt	Finished Size			Piece
		T	W	L	
1	A	3/4"	10"	12"	head/mane
2	B	3/4"	8"	12"	head
1	C	3/4"	diam	8"	reins
2	D	2	4	19"	body
1	E	1/4"	3 1/2"	7"	saddle batten
2	F	1 1/2"	6"	13 9/16"	rear legs
2	G	1/4"	1 1/2"	2 5/8"	rear shoes
1	H	1 1/2"	4 3/4"	13 3/8"	st. foreleg
1	I	1 1/2"	6"	11"	bent foreleg
1	J	3/4"	9"	9 1/4"	saddle
2	K	3/4"	5"	9"	stirrups
2	L	3/4"	diam	3 1/2"	stirrup steps
2	M	1 1/2"	6"	36"	rockers
1	N	3/4"	3 1/2"	15"	cross brace

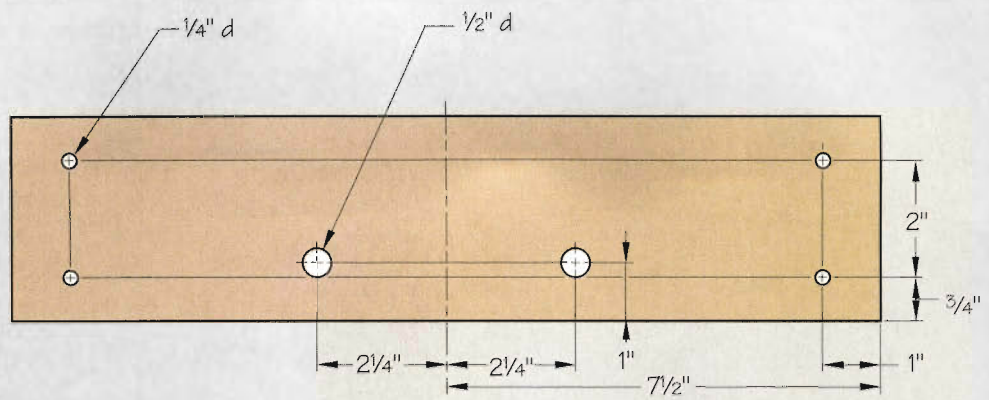


Figure 1

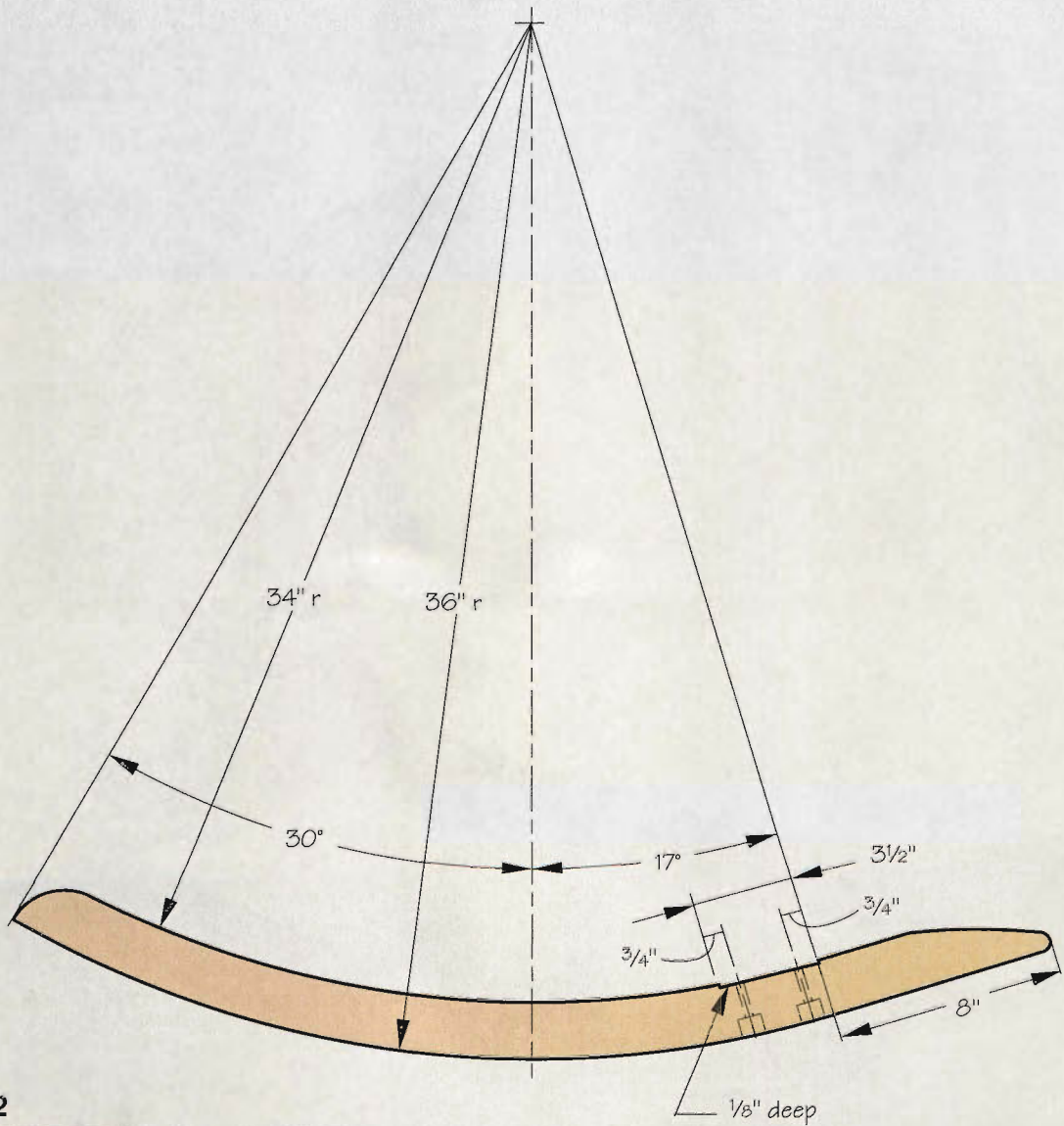


Figure 2



All the body pieces, painted and ready for final assembly.



Yarn is softer, but rope can be substituted for a coarser feel.

Cut the saddle piece (J) to shape and rout a $\frac{3}{8}$ " radius around the top edge. Note the grain direction shown on the full-size pattern. Cut the batten piece from plywood to the size given in the Cutting List. Locate the batten on the underside of the saddle as shown in the PullOut™ Plans, then glue and nail it in place with the surface grain 90° to the grain in the saddle. Locate, drill and countersink the mounting screw hole through the saddle and batten as shown on the full-size pattern. Sand this sub-assembly smooth. It is now ready for finishing and final assembly.

Cut the stirrups (K) to shape, again observe the direction of the grain. Drill a $\frac{3}{4}$ " diameter flat bottomed hole $\frac{1}{2}$ " deep in each piece as shown on the full-size pattern. Be careful to end up with a left-hand (shown) and a right-hand piece. Cut stirrup steps (L) from dowel rod, as given in the Cutting List. Chamfer one end of each piece and form a slight radius on the opposite (outboard) ends. Glue the chamfered ends into the holes in the stirrups and fasten them in place with wood screws. Layout, drill and countersink the two holes in each stirrup sub-assembly for their attaching screws as located in the PullOut™ Plans. Sand all the surfaces and sharp edges.

Lay out the two rockers (M) as shown in Figure 2. Note that the rear 8" of each rocker is straight and tangential to the curved portion. This reduces the likelihood of an overly ambitious little rider going over backwards. Shape the front and rear ends of the rockers and cut the dadoes as shown in the Figure. Stack and clamp the rockers together then sand. Drill the two $\frac{1}{4}$ " diameter holes for attaching the cross brace (N) in each rocker as shown in the Figure. Counterbore the bottom of these holes to accommodate retaining washers and hex nuts. Rout all edges with a $\frac{3}{8}$ " round-over bit.

Cut out the cross brace and drill four $\frac{1}{4}$ " diameter holes and two $\frac{3}{8}$ " diameter holes as shown in Figure 1. Install the cross brace in the dadoes on the rockers. Fasten the cross brace to the rockers with glue and four $\frac{1}{4}$ " diameter X 3" carriage bolts, nuts and washers. Be certain that both rockers are square with the cross brace. Tighten the hex nuts securely. Cut off the three or four threads of the bolts that

protrude beyond the lower radius of the rockers and grind the ends of the bolts flush. Mix clean sawdust and wood glue to a paste consistency and fill the voids around the retaining nuts in the counterbores. This sub-assembly is now ready for final sanding and finishing.

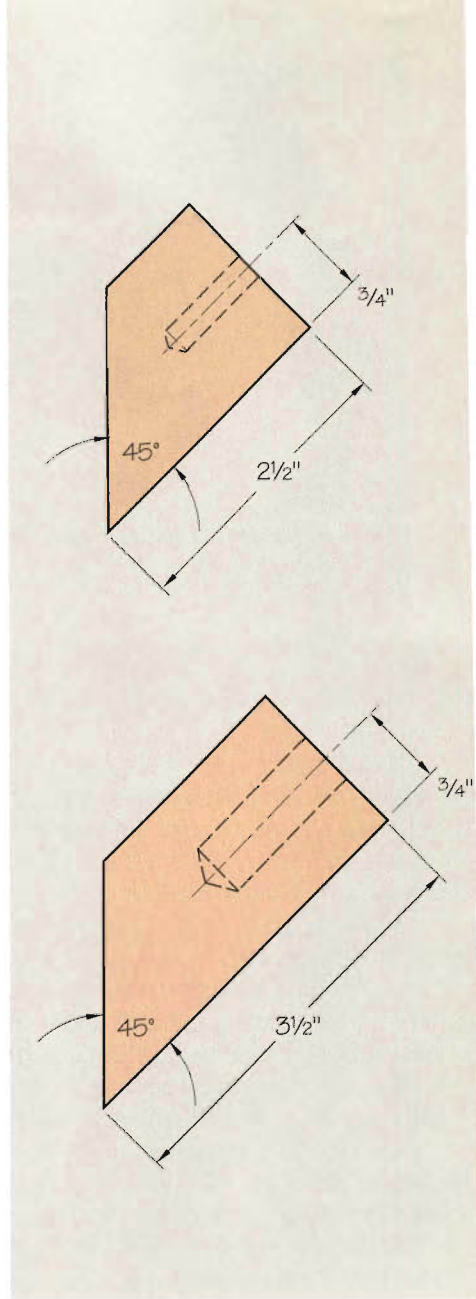
Insert the tenon portion of the head sub-assembly into the mortise cut in the body portion and check for a good fit. Apply glue to the mating surfaces and draw them together with a $\frac{1}{4}$ " diameter X $3\frac{1}{2}$ " lag screw and flat washer. Sand the blended radii at the front of the assembly.

Bolt the finished forelegs to the body with $\frac{1}{4}$ " diameter X 3" carriage bolts. Attach the saddle and the finished stirrups to the body. Snugly fasten the two hind legs to the rocker sub-assembly with two $\frac{3}{8}$ " hex nuts and flat washers. Do not fully tighten the nuts at this time. Fit the body between the hind legs and check the alignment of the $\frac{1}{4}$ " diameter mounting holes, with the centerline of the body parallel with the rockers. Line bore through with a $\frac{1}{4}$ " diameter extension drill to correct any misalignment. Install the $\frac{1}{4}$ " diameter X 3" carriage bolts through the hind legs and tighten the hex nuts and washers snugly. Place the horse on a flat, sturdy work surface and position the body level, or inclined slightly upward, before tightening the retaining nuts. Tighten the $\frac{3}{8}$ " hex nuts under the cross brace.

Make the ears from flexible leather using the pattern given in the PullOut™ Plans. The tail is made up of 32 strands of orlon knitting yarn (worsted weight, 4-ply) to match the color of the mane—it's 9" long. Tie a serving of yarn around one end and glue it into the $\frac{1}{2}$ " diameter hole in the rump as shown in the photo above.

The prototype horse was painted in four colors. The head, body and legs were painted chocolate brown and the hooves were painted gloss black. The mane and the rocker sub-assemblies were painted tan and the saddle and the stirrups were painted dark brown.

You won't have to teach your little bronc-buster how to ride this horse! Just get out the boots, britches, western hat, and your camera. You'll enjoy the pictures for years to come. **DW**



Bit Storage Cabinet

by Hugh Foster

One of my friends is just about the smartest woodworker I know. He works in a very small but well equipped shop. He's smart because he's so organized. When I saw a wall-mounted cabinet in his shop which houses router bits, drill bits, plug cutters, and other small accessories, I knew I'd have to build one like it. When I quizzed him about the dimensions, he said that his cabinet was the size it was because he had saved a door that size. I realized that the size of the cabinet is a question of convenience or on-hand materials.

Cut the angled blocks to the rough dimensions shown in

the figures above from 2 X 4s. The angled blocks run the full inside width of the cabinet. The sides, top, bottom and shelves are 1/2" plywood.

Lay the cabinet on a large flat surface and arrange the spacing of the angled blocks as shown in photo 1. Because of the many router bits, drill bits, plug cutters and other small accessories I have, I decided to make the back of the case almost solid with angled blocks.

Decide on the number of angled blocks you need and their position. Trace the outline of the ends of each block onto one of the side pieces, then remove them and mark the location of their centers on a side piece. Clamp the side pieces together and drill through them as shown in photo 2.

Hugh Foster is a Contributing Editor and is not a bit disorganized.



photo 1
Arrange the angled blocks to accommodate the number and different types of bits you own. Plan ahead for future additions.

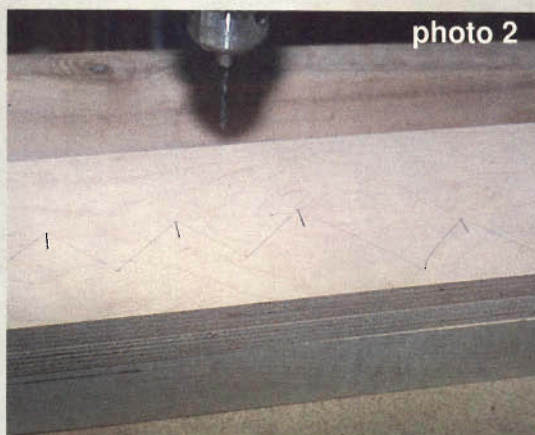


photo 2
Use a small piece of double sided tape between the pieces to keep them aligned while drilling.



photo 3
Space the holes for the bit shanks based on the diameter of the their heads.

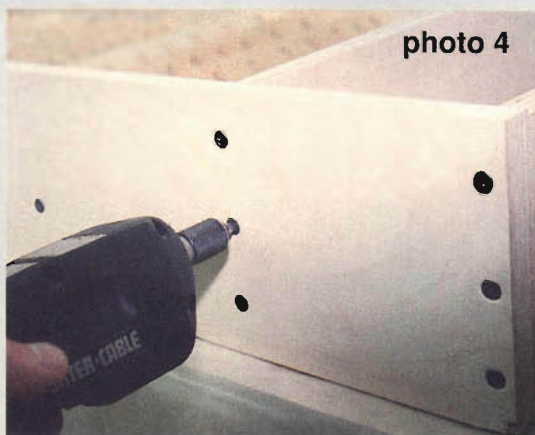


photo 4
Use 1" dry-wall screws to fasten the sides, shelves and the top and bottom.

Place two angled blocks, back to back, in a V block as shown in photo 3 and clamp them to the drill press table. Drill slightly oversized holes in the blocks for the shanks of your bits and accessories. The shanks of my accessories are $\frac{1}{4}$ ", $\frac{3}{8}$ " and $\frac{1}{2}$ " in diameter. The $\frac{1}{4}$ " holes are 1" apart; few accessories with $\frac{1}{4}$ " shanks require more space. The $\frac{3}{8}$ " and $\frac{1}{2}$ " diameter holes vary from $1\frac{1}{4}$ " to 2" apart since some of these cutters are quite large. Stagger the holes to allow easy insertion and removal of the cutters.

Screw and glue the unit together through the sides as shown in photo 4. Apply glue to the angled blocks where they meet. A cordless drill/driver and sheetrock-type self tapping screws make the process quick and easy.

Make the face frame from nominal 1 X 2 boards. Glue the frame assembly together and fasten it to the cabinet with biscuits or use glue blocks along the inside of the frame.

Cut a door to fit and mount it with whatever kind of hinges you have on hand. I used three hinges rather than the usual pair so I could mount three additional blocks on the inside of the door for my long drill bits.

Apply a light finish coat to the inside and outside of the cabinet.

Level and mount a short length of 2 X 2 to the wall with $\frac{1}{4}$ " diameter lag bolts driven into the wall studs. Set the cabinet on the 2 X 2 and fasten it to the wall with lag bolts through the angled blocks and into the wall studs. **PW**

Revolving Bookcase



Use a stop block to keep the rip fence a safe distance from the saw blade.

by Jeff Greef

Here's a space-saver bookcase that can be located in a corner or in the middle of a room near other furniture. It holds as many books as a four foot square wall unit, but requires little if any wall space. The revolving feature is easy to make with lazy susan swivel hardware that's available at most hardware stores. This is a table saw project, though a router table and stationary sander will help. All the joinery is done with dado cuts or with multiple passes over a standard kerf blade. Use your favorite hardwood—almost any will be sufficient, I used cherry.

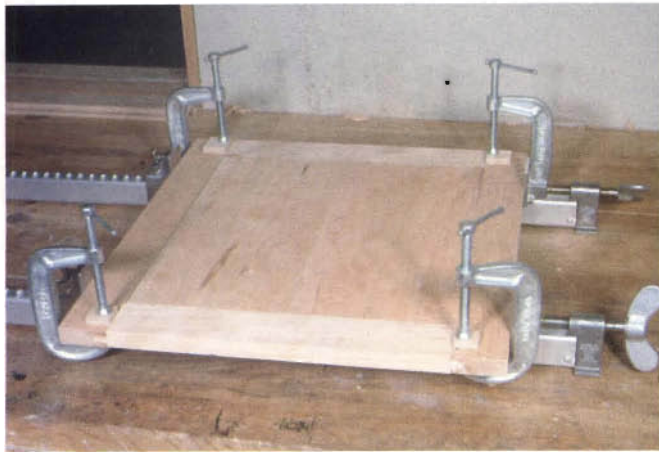
Shelves

The shelves are frame and panel construction. Pick straight 1X stock for the shelf frames and panels for ease in edge-gluing, and constructing tight fitting frame joints.

Jeff Greef works wood in Santa Cruz, California

Glue up the blanks for the shelf panels (A) and cut them to the dimensions given in the Cutting List. Cut the long panel frames (B) and the short panel frames (C) to the dimensions given in the Cutting List. Cut the frame blanks to uniform lengths using a stop block on the radial arm saw. Install a 1/4" dado head in the table saw and cut 1/4" X 1/2" deep mortises centered along the inside edges of the long and short side panel frames to receive the panels. To center the mortises, push the frame through the blade twice, starting from opposite ends of the blanks.

Set up a 1/2" dado head cutter on the table saw and cut the tenons on the short frame ends. Screw a backup fence to the sliding miter fence, then cut 1/2" X 1/4" deep rabbets in both ends and on both sides to form the tenons. Keep a safe distance between the rip fence and blade by clamping a stop block to the rip fence as shown in the photo above. Butt the frame end against the stop block on the rip fence, hold the rail

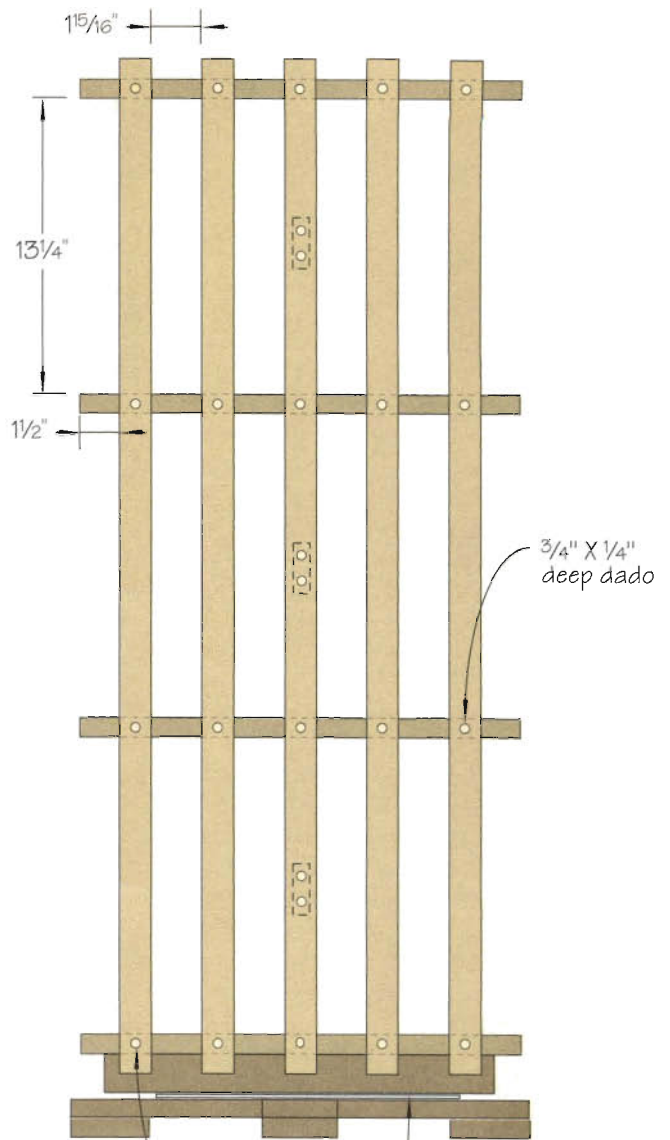


Glue and clamp the frame around the panel. The panel should float inside the frame, yet not loosely.

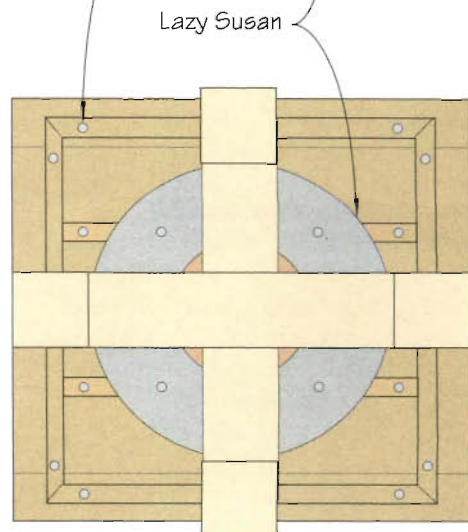
firmly against the miter fence and push through the blade.

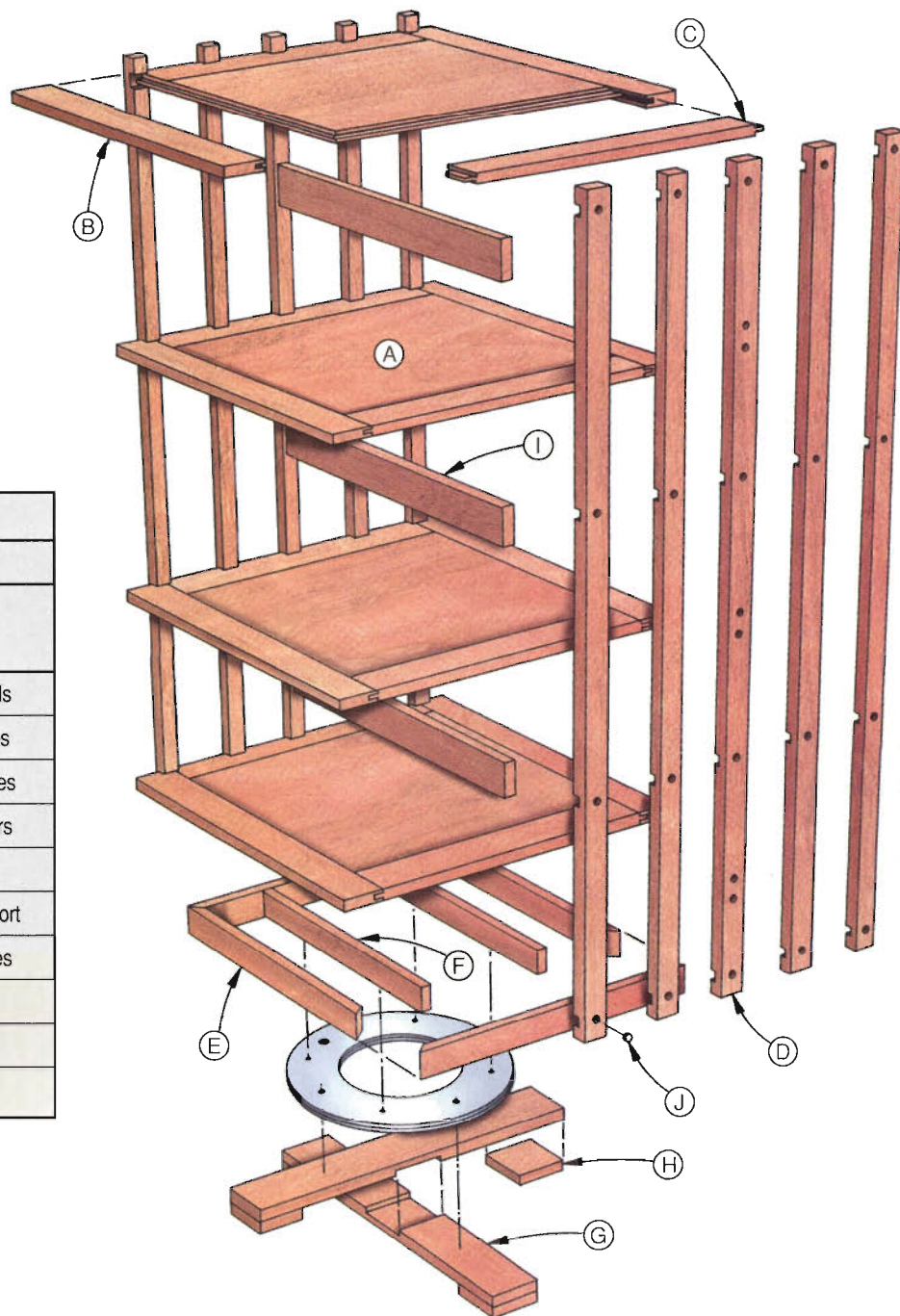
To cut the tenons on the panels, install a $\frac{1}{4}$ " dado blade in the table saw, and cut both sides of each panel along the length of each edge. Position the fence $\frac{1}{2}$ " from the blade and set the height to $\frac{1}{4}$ " to make the cuts on the end-grain. Raise the blade a $\frac{1}{16}$ " and cut with the grain. This gives the panel room to expand in the frame with moisture changes so the panel won't push the frame apart. Do not run your fingers directly over the blade, rather move your hand around the blade to the front of the panel halfway through the cut.

Glue the frames together around the floating panels. Do not glue the panels to the frames. Use bar clamps to pull the long frames and short frames together. Then use C-clamps to secure the joints as shown in the photo above. Check the assembly for square by measuring corner to corner diagonally—if it's square, the dimensions will be identical. If there is any squeeze-out, let it dry then remove with a chisel.



Side View





Revolving Book Case						
Cutting List						
Qty	Part	Finished Size			Piece	
		T	W	L		
4	A	3/4"	13 3/4"	14 3/4"	shelf panels	
8	B	3/4"	2"	18"	long frames	
8	C	3/4"	2"	14"	short frames	
10	D	3/4"	1 1/4"	44 1/4"	vertical bars	
4	E	3/4"	1 1/2"	15 1/2"	base trim	
2	F	3/4"	1 1/2"	14"	base support	
2	G	3/4"	3"	18"	base pieces	
4	H	3/4"	3"	3"	foot pads	
4	I	3/4"	2"	17 1/2"	dividers	
52	J	3/8"	diam.	1/4"	plugs	

Vertical Bars

Cut the blanks for vertical bars (D) as dimensioned in the Cutting List. Install a 3/4" dado blade set 1/4" deep to cut the four shelf dadoes in each vertical bar. Screw a backup fence to the sliding miter fence as you did for the tenons to backup the cut and to prevent tear-out. Use the rip fence as an end stop to locate the dadoes along the length of the bars as shown in the photo above right. Note that the end dadoes are 3/4" from each end of the bar, use the same setup to cut each end dado by simply flipping the bar. The two middle dadoes are evenly spaced between the outer dadoes, so the same principle applies. Break the edges of the vertical bars with coarse sandpaper.

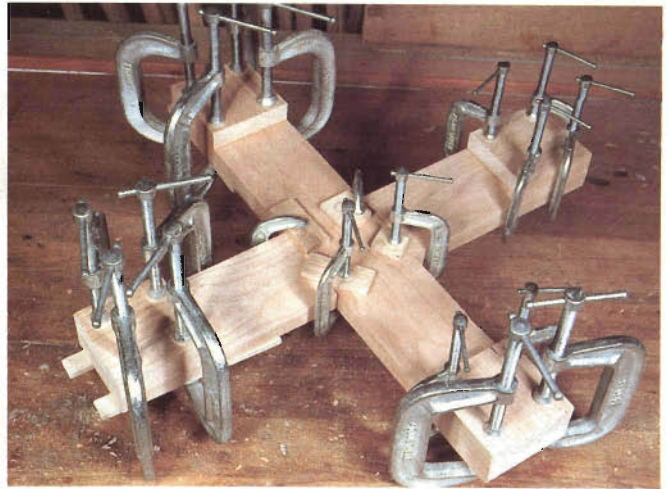
Lower Trim, Dividers and Support

Cut the blanks for the base trim (E) and the base supports (F) to the dimensions given in the Cutting List. Cut 45° miters on each end of the lower trim pieces and screw the fascia to the bottom of the lowest shelf with #8 X1" FH wood screws. Screw the base supports in place, evenly spaced between the lower trim as shown in the photo above right.

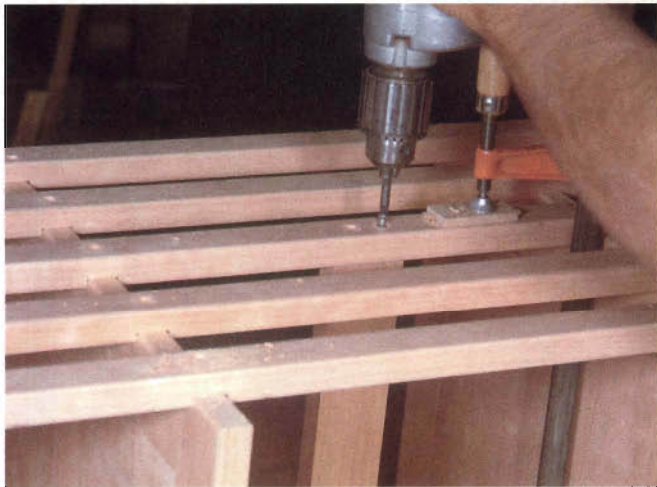
Cut the the base pieces (G) and the foot pads (H) as dimensioned in the Cutting List. Prepare the table saw to make the 3" half-lap joints in the center of the base pieces with a setup similar to the one you used to cut the dadoes in the vertical bars. Cut the foot pads for the ends of the base and cut the dividers (I) as dimensioned above.



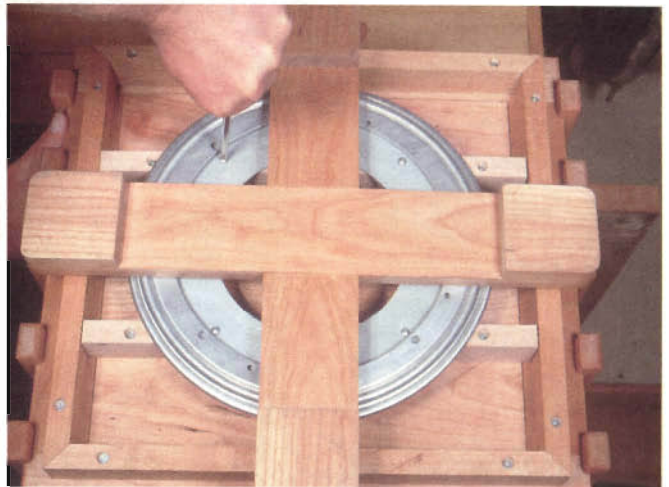
You just need to set the rip fence on the table saw twice to make all the dado cuts in the vertical bars.



Before gluing footpads on the base piece ends, check the assembly for square.



Locate the dividers midway between the shelves, and centered on the middle vertical bar.



A lazy susan provides the swivel action between the case and lower support assembly.

Assembly

Place the bars on the long frame sides of the shelves. Use a bar clamp to hold the vertical bars and shelves in place and locate the screw holes as dimensioned in the Side View figure. Drill 1" deep tapered pilots for the #8 X 1" FH wood screws and use a $\frac{3}{8}$ " diameter X $\frac{1}{4}$ " deep counter sink to accommodate the plugs (J). After the vertical bars are attached to the shelf frames, clamp and screw the dividers in place. Glue and clamp base pieces and foot pads as shown in the photo above.

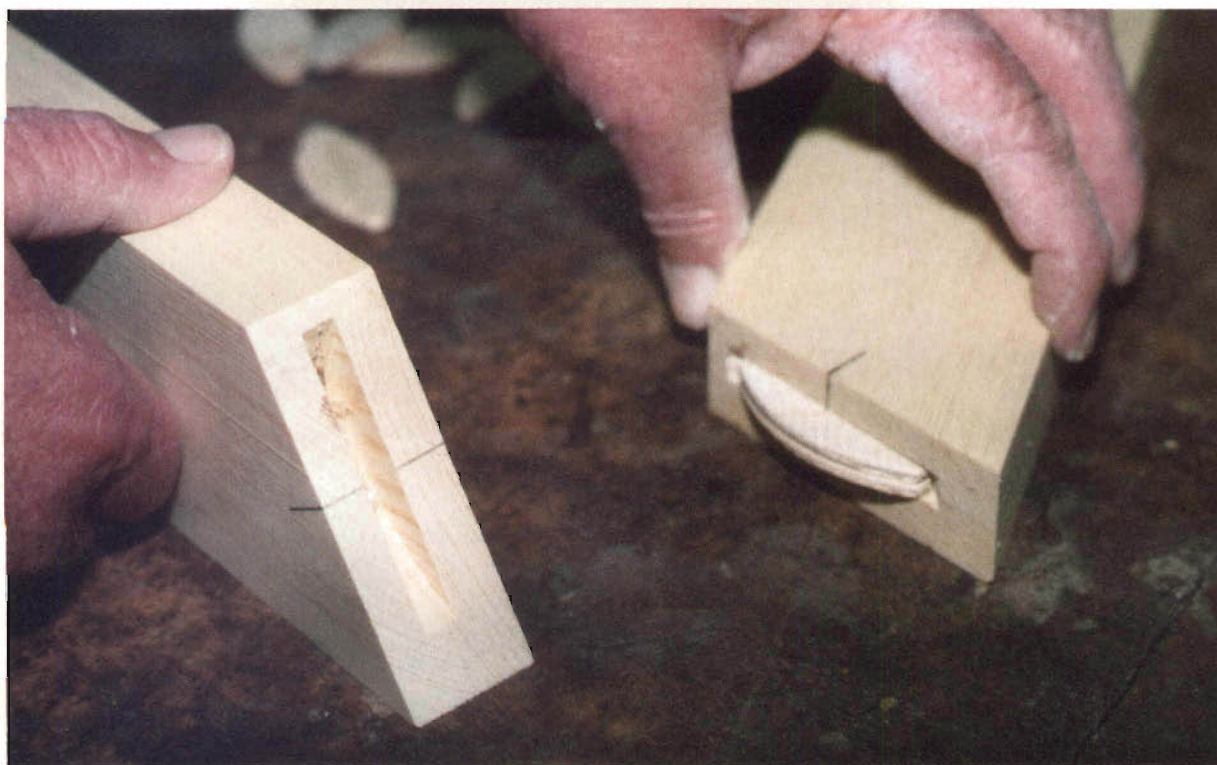
Cut out $\frac{3}{8}$ " plugs for all the holes with a plug cutter on the drill press, or using a hand drill. Glue the plugs into the holes. When the glue dries, level the plugs with a chisel or block plane.

Lazy susan swivel hardware comes in a variety of sizes. Don't use one smaller than 12" in diameter, because the bookcase would be unstable.

Screw the lazy susan to the base first, then screw that assembly to the support pieces already in place on the cabinet. A wipe-on oil finish is a good choice for a piece like this because it has a lot of surfaces and corners that would be hard to hit with a brush. You don't need the kind of protection that a brush-on polyurethane provides because the bookcase is unlikely to get wet.

Better fill it up with books before the kids get to it though, or else they may believe you made this new "spin toy" just for them. **PW**

Dual Biscuit Joinery



by Dick Dorn

I hesitated to buy a plate joiner for our high school wood-working shop. How could those thin, football-shaped biscuits be a suitable alternative for strong, reliable wooden dowels that we have depended on forever? But, as a teacher, I wanted my students to be aware of the plate joiner and a system called biscuit-joinery. My original intent was to use the plate joiner for demonstration purposes only. That was two years ago.

Within a few short weeks, thanks to the eagerness of my students, the plate joiner became an extremely important tool in our shop inventory—and it was a popular tool. Many of our old construction methods began to change, work seemed to progress much faster and new projects were designed to take advantage of the plate joiner's capabilities. I continued to buy more bags of biscuits and eventually we added a second plate joiner to our inventory.

I conducted my own unofficial tests to convince myself that biscuit-joinery was sound. One advantage I immediately noted was the established fact that biscuit-joinery will allow some minor lateral adjustment during assembly of parts while tight-fitting dowels are unforgiving. The biscuit-joinery system would give my inexperienced students a few more minutes to adjust and properly assemble their work. Conversely, clamps had to remain in position on biscuit-joined pieces for

a much longer period of time because the glue needed time to cure completely for maximum strength. In short, preparation and assembly of biscuit-joinery is faster and easier than conventional dowel joinery, but the required clamping time is much longer.

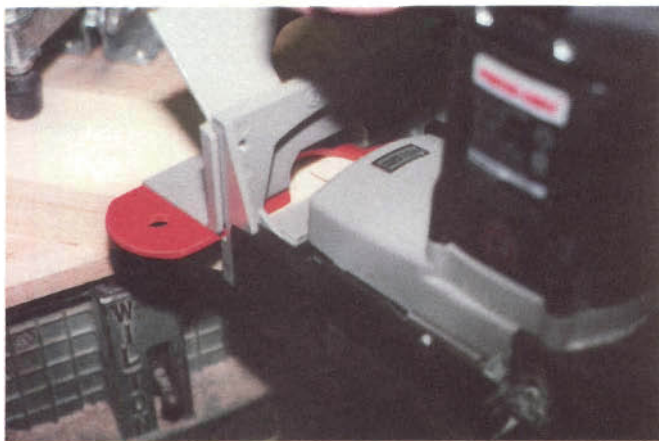
My primary concern, however, was the strength of individual joints necessary for leg-to-apron or leg-to-rail construction on projects such as tables or chairs. When a limited thickness on the ends of aprons or rails allowed the use of only one biscuit, the strength of the joint was doubtful when compared to two dowels. Thicker aprons or rails (1" or more) could accommodate two side-by-side biscuits for added strength. But in our shop we seldom use surfaced material thicker than $\frac{3}{4}$ ", so the use of side-by-side biscuits was impossible.

I experimented. My goal was to continue to use the standard $\frac{3}{4}$ " thick material and to strengthen the joints by using dual biscuits. To accomplish this goal I needed to cut grooves with our plate joiner that were $\frac{5}{16}$ " wide (double

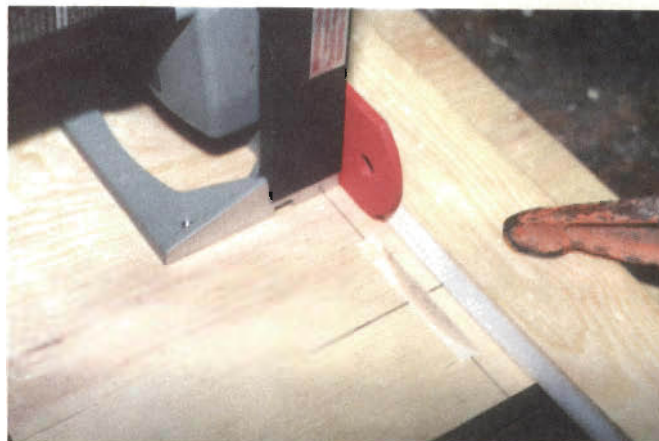
Joints may be strengthened with two side-by-side biscuits on stock 1" thick or larger.



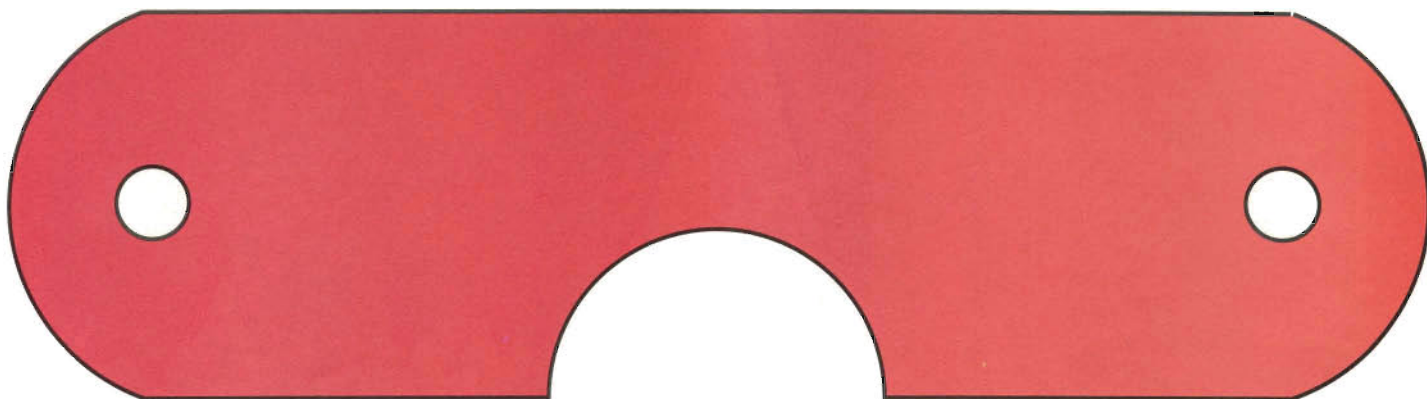
Dick Dorn is a contributing editor to Popular Woodworking. He teaches high-school shop in Oelwein, Iowa.



Place the spacer under the fence of the plate joiner and use the same center lines to place the second cut.



Dual biscuits can be used in many different joining situations for added strength.



full-size spacer pattern

the usual $\frac{5}{32}$ " width) to accept dual biscuits. I used some scrap material for testing and cut grooves just below the center line which would accept single biscuits. After the initial grooves were cut on all adjoining pieces, I meticulously reset the plate joiner fence so I could widen each of the previously cut grooves to $\frac{5}{16}$ ". A liberal layer of glue was spread between the dual biscuits before they were inserted into the glue-coated, widened grooves.

Assembly of the adjoining pieces that used dual biscuits was almost as easy as using single biscuits. I was satisfied with the results and I felt comfortable with the added strength of the joints. The only hassle was the fact that the plate joiner fence had to be repositioned accurately to cut the widened grooves to precisely $\frac{5}{16}$ ".

My second attempt to widen grooves to $\frac{5}{16}$ " for dual biscuits was much easier. As before, I marked the centerline for each groove position and made the initial cut with the plate joiner. But this time I placed a spacer under the plate joiner fence, used the same centerline as for the initial cut, and made the second cut which automatically formed the groove for dual biscuits. The plate joiner fence didn't have to be repositioned at all because the dual biscuit spacer lifted the blade of the joiner exactly the thickness of one biscuit. My dual biscuit spacer is merely a piece of wood cut to the exact thickness of a biscuit ($\frac{5}{32}$ "), the exact width of the plate joiner fence, and long enough to extend past each end of the fence so it can be easily handled. A dished area was centered and

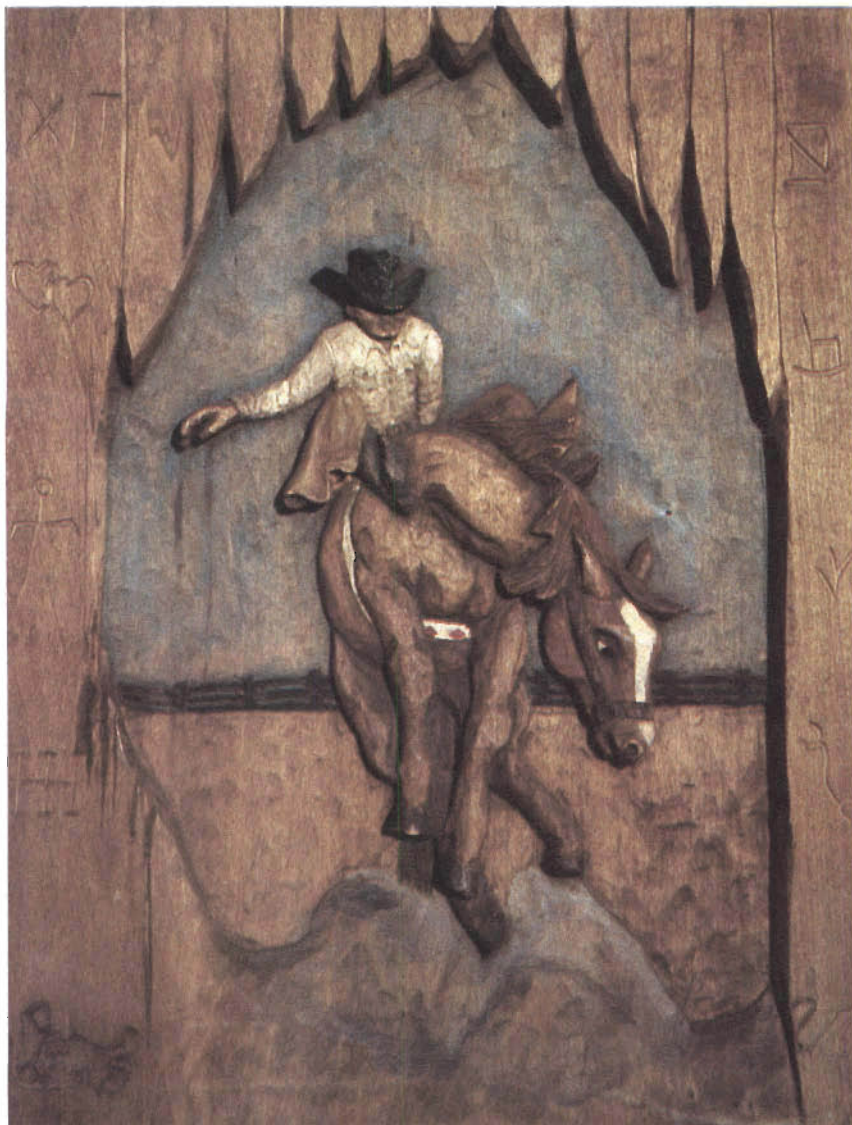
cut along one edge of the spacer so layout lines and plate joiner center lines would be visible. A hole drilled at each end of the dual biscuit spacer helps with finger grip during use and provides a means to hang the spacer safely until it's needed again. **PW**

Coat the surface between the two biscuits with glue before they are inserted into the groove.



Rodeo Rider

Relief carve this timeless scene of western nostalgia.



by Jack Ekstrom

Louise Ward is a well-known carver from Washington. She has carved hundreds of pieces. She adapted her Rodeo Rider pattern from a photograph, putting the horse and rider in a dusty arena. The unique frame and the carving are part of the same piece of wood; a soft, tight-grained basswood plank measuring $\frac{3}{4}$ " X $9\frac{1}{2}$ " X 12". The sides of the frame are decorated with cattle brands.

Relief carving is easier than carving in-the-round and makes this an ideal project for beginning carvers. Only the front side is carved. A full size pattern is in the PullOut™ plans.

There are several distinct levels to the pattern. The arena sky is the lowest part of the carving and is almost $\frac{3}{8}$ " deep. The arena floor below the fence is $\frac{1}{4}$ " deep and the dust cloud under the horse is $\frac{1}{8}$ " deep. The horse and rider are combinations of different depths, with much of their detail on the top surface of the wood, level with the frame.

Tools

The Rodeo Rider uses the most basic and ancient of carving tools—the straight chisel. To make it even easier to carve try using two variations of the straight chisel, the skew and

oriental right, along with left-handed "Into" knives. A knife isn't needed if you use a skew chisel or the Intos.

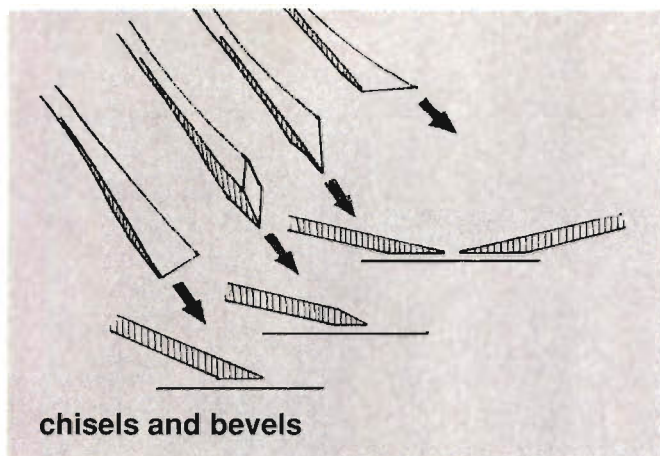
Usually, it is best to keep the beveled edge down with a chisel, because the bevel serves as a fulcrum to help release the wood. Sharpen the chisels by pushing them on a stone with the bevel down. Sharpen only the bevel, then smooth off the wire edge on top with just one pass on the stone. Stop them by snapping the bevel on leather like a barber.

Safety Rules

Relief carvings are seldom hand-held while carving, however it's important to keep both hands on the carving tool as much as possible. You must be aware of pushing the tool because if you hold the carving with one hand and push with the other, you're apt to push the tool into your hand. To avoid serious injury, use a bench stop (see *PW* #73, page 68). Keep tools sharp, and remember the safety rules.

(1) The first rule is very important when using chisels: never force your tool. (2) Always keep both hands behind the tool. (3) Use two-handed cuts whenever possible. (4) Cut only a little bit at a time. (5) Always have an adhesive bandage handy.

Jack Ekstrom is a writer and illustrator from Colorado and former editor of *The Mallet*, the journal of the National Carvers Museum.



chisels and bevels

Stop-Cutting

After tracing the pattern onto your wood, begin with the skew chisel or an "Into" knife. Skew chisels are beveled and sharpened on both sides, unlike other chisels which are sharpened just on the bottom side. A skew chisel is like a knife and is held like a pencil with fingers on the blade itself and drawn along the inner edge of the frame, about $\frac{1}{16}$ " deep. Go all around the frame. Stop-cuts or draw-cuts are always the first cuts made when relief carving. A stop-cut is a specific cut made to stop the chisel from going any farther. The closer you hold the skew chisel to the point as you make the stop-cuts, the more control you have over it.

Skew-Chiseling

After making the stop-cut, use the skew, flat on the wood, and gently push it up to the stop-cut, going no deeper than $\frac{1}{16}$ " at a time. If skew chiseling with the grain of the wood, use the stop-cut as a guide for the tip of the skew as you push it along the stop-cut. When chiseling across the grain, cut up to the stop-cut and go no farther. Never chisel deeper than the stopcut.

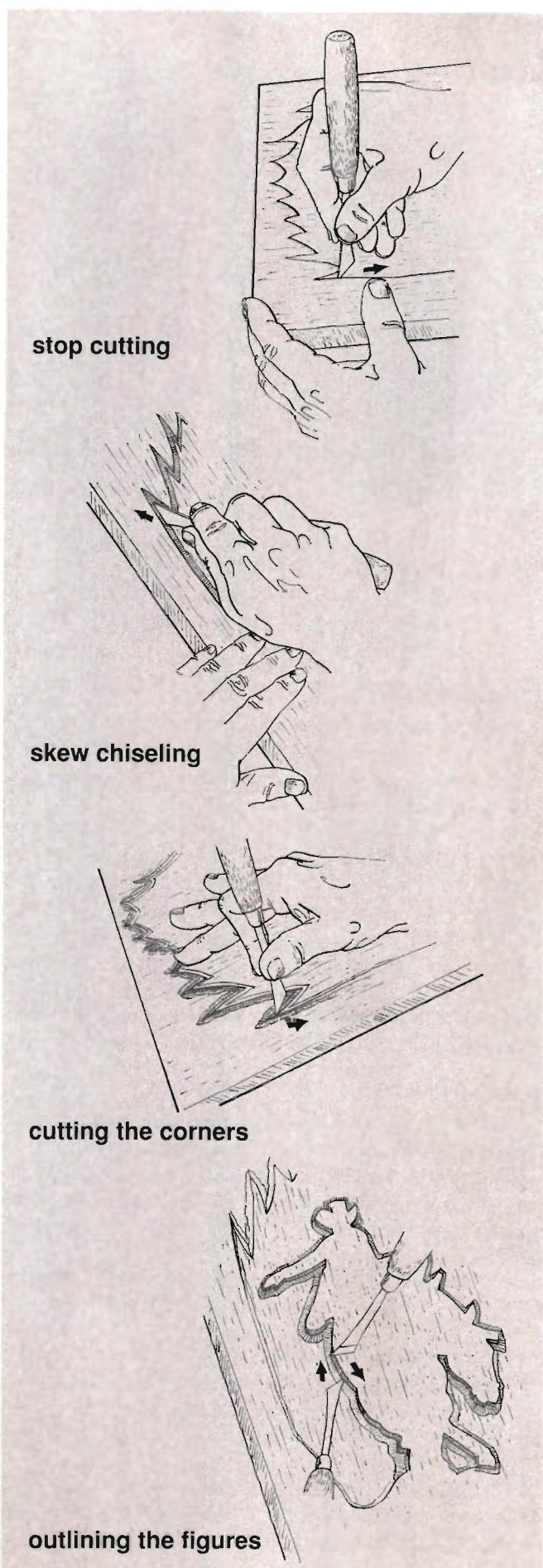
Skew-chisel all the way around the inside of the frame, cutting a v-shaped groove no deeper than the stop-cuts. Use the tip of the skew to carefully remove the wood in the sharp corners of the frame. The stop-cut and the chisel-cut meet in a sharp edge—remake these cuts as often as necessary to remove the wood without tearing it. Angle most of the top edges of the frame inward so the frame isn't straight up and down.

I prefer to use the right- and left-handed "Into" series knives from Warren Tool Co., Inc., which are beveled only on one side, like a straight chisel. The two tools have long, flat corners that are handy for both detailing and chiseling. Each has its own important use—in the sharp corners of the frame and especially in the corners and edges of the figures.

Hold the Into vertically in the corners of the frame and figures. Control the tool with the forefinger and thumb and hold your hand steady with the other three fingers spread on the wood. Push the tool straight down and then pull it toward you for a sharp, clean cut.

Outline the Figures

Stop-cut all the way around the outside of the rider and the horse the same way as the inside of the frame, only

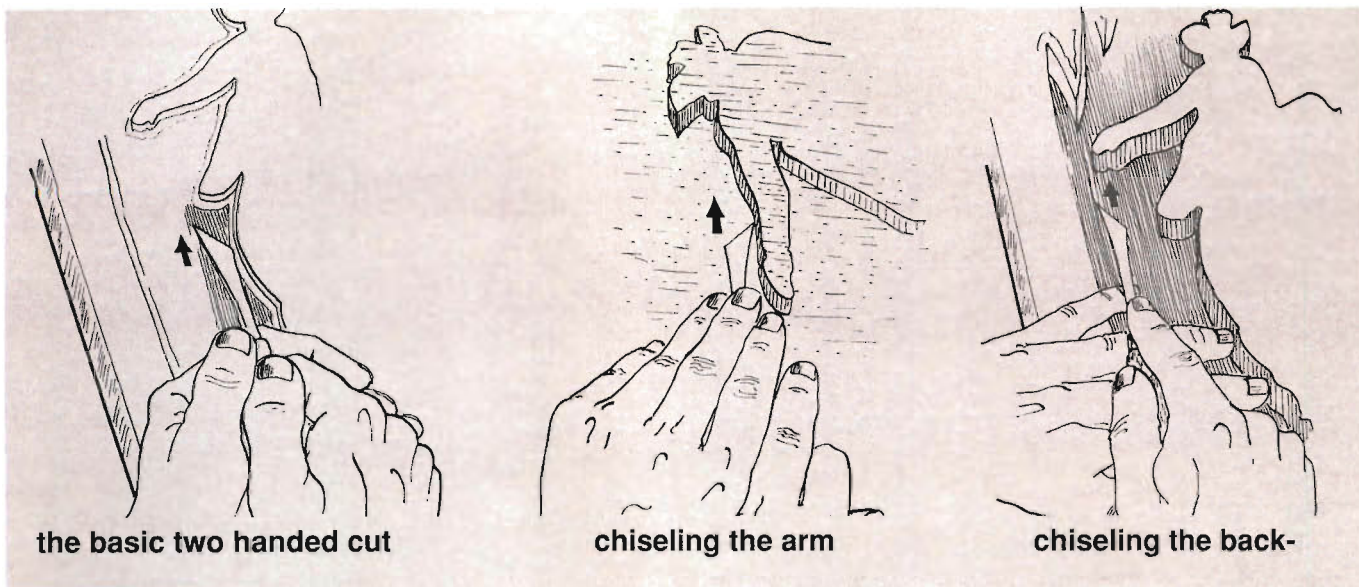


stop cutting

skew chiseling

cutting the corners

outlining the figures



going about $\frac{1}{16}$ " deep at first. Make the belly and the legs of the horse very round, as well as the shoulders and arms of the rider. Use the skew chisel to cut a V-shaped groove up to the stop-cuts all the way around the horse and figure, as around the inside of the frame.

Chisel the Background

Begin by removing all the wood between the frame and the figures with the chisel. Use either the skew chisel or a straight-edged chisel. Chisel mainly in the direction of the woodgrain, go only as deep as the initial stop-cuts.

When chiseling everywhere except around the rider's arm and the forelock of the horse—two pieces most likely to break or chip—hold the tool by its handle, well back from the edge. The long shank helps to apply more leverage. Cradle both the tool and carving hand in the palm of your other hand. The forefinger of your carving hand may be left either on top of the shank, or around it like holding a screw driver. There are several variations of the two-handed cut. When chiseling details, especially around the arm, hold the tool much closer to the tip.

Outlining the Arm

Be very careful of the rider's arm and fingers. Control the chisel with the fingers or thumb of your other hand—don't let the tool slip into the arm. Carve mainly across the grain, following the line of the arm on both its top and bottom. The sharp point of the skew chisel is very helpful here. Use this same technique on the other fragile parts of the carving—the boot and the tips of the chaps, the lock of hair on the horse's forehead, the horse's ears and its left rear leg.

Finishing the Background

After chiseling away all the wood between the frame and the figure at least $\frac{1}{16}$ " deep, repeat the stop-cuts and chiseling until the background is $\frac{3}{8}$ " deep. Don't carve the fence as deep as the sky.

The inner edges of the frame are mostly 90° to the background, but the dust under the horse has no straight edges; chisel the dust so it meets the background with rounded edges.

Draw-Cut the Horse

Hold the knife or skew chisel like a pencil and draw-cut the legs of the horse and the bottom of its neck. Draw-cutting is no different than stop-cutting, except that draw-cuts are at more of an angle off the vertical. Instead of chiseling up to the cut, use the knife or skew chisel to remove the wood with V-cuts. The skew chisel is the handiest tool because the angled tip can easily remove the wood between the horse's legs.

V-cuts are two draw-cuts that meet in the shape of a "V". The bottom of a V-cut should always be a sharp line. First, draw-cut both sides of the horse's front legs about $\frac{1}{16}$ " deep; then make a second draw-cut at an angle to the first. Cut carefully so the V-shaped pieces of wood along the legs come out cleanly. Repeat the cuts until each leg is at least $\frac{1}{8}$ " deep. V-cut under the neck in the same manner. The chest is divided with a deep V-cut, as are the pits where the legs join the body and the long curve of the belly where it meets the tops of the back legs.

Draw-Cut the Rider

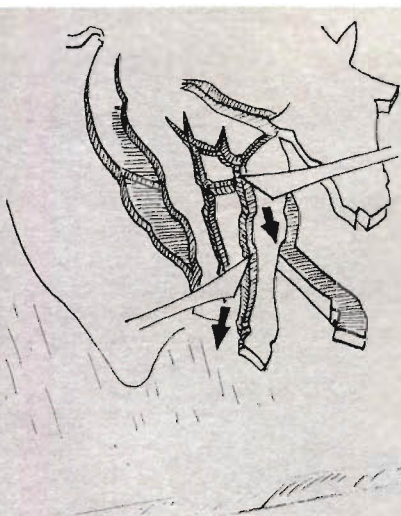
The rider's belly is his lowest part—chisel it almost as deeply as the background, at least $\frac{5}{16}$ " deep. Cut a series of V- and stop-cuts to get to the proper depth. The rider has a half a dozen different levels. His hand, the front sole, his knee and right chap remain on the top of the wood, level with the frame.

Hat Brim and Right Boot

Start with the rider's knees. V-cut the inside of the right leg until you get down to the shirt; use a combination of V-cuts and stop-cuts with chiseling. Go down very carefully; shape his leg as you go. Draw-cut the same way along the top of the horse's neck, but only go down $\frac{1}{8}$ " to the knuckles on the rider's left hand. The knuckles are another $\frac{1}{8}$ " above his belly.

The upper part of the rider's right leg and behind the chap are under-carved at least $\frac{1}{8}$ ", so they appear free of the wood. Carve deeply under the bottom of both chaps as well, so they appear to flap loose over the horse.

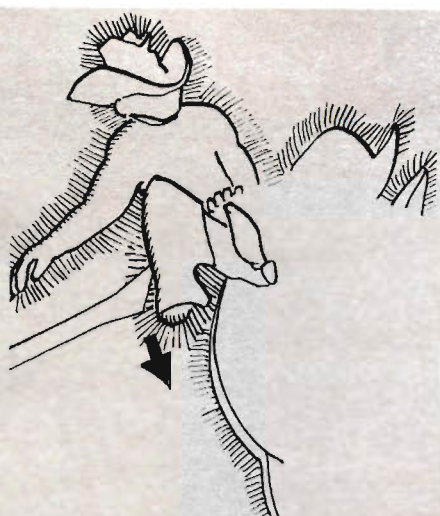
One important variation of the two-handed cut is to guide the tool with the forefinger of your other hand as you draw-cut, pulling both forefingers inward. Rest the other forefinger on the



V-cutting the legs



carving the rider



under carving

back of the blade, or even on top of the carving forefinger. This provides good control over the tool.

Draw-cut all the features of the rider. The brim of the hat goes from $\frac{1}{8}$ " deep at the rider's nose to $\frac{3}{8}$ " deep behind the ears. His chin is $\frac{1}{8}$ " above his collar. The left arm is $\frac{1}{8}$ " higher than the belly. His chest slopes down to his belly in a concave curve and curves from side to side like a barrel.

Detail the Horse

Much of the horse remains at the top level of the wood. Carve each part as round as possible. Under-carve about $\frac{1}{16}$ " all around the back of the horse and rider, so they aren't visibly coming out of the wood. This effect makes them appear suspended.

The only sharp edges of the horse are the hooves, the mane, the ears and the head. Chisel straight down along these edges. In the same way, detail the edges of the bridle and cinch with the point of the skew. Use it to V-cut the mane and tail as well. The mane is $\frac{1}{8}$ " above the left chap and boot.

The horse's head is bony compared to the rest of its body. The cheek, forehead and nose are more flat than round. The eyebrow over the eye is $\frac{1}{8}$ " deep and sharp. The nostril is $\frac{1}{8}$ " deep and the mouth is a $\frac{1}{4}$ " V-cut. Each ear is $\frac{1}{8}$ " above the wood. V-cut the ring in the bridle carefully and, last of all, V-cut the pupil of the eye. Carve the eyeball to appear round.

Detail the Rider

Use the two-fingered cut for all of the fine details. Use your own hand as a model when carving his right hand. The rider's left hand is turned up holding the cinch strap, so all you carve are his four knuckles and thumb. They're small but important because they're right in the center.

Be sure to touch all the wood with the knife so that even the parts at wood-top level are altered. All the edges of the rider should be round. This guy doesn't have a square part on him. Feel his muscles and the billowing fabric in his shirt and chaps when carving them. The long, sharp points of the Into tools are especially welcomed here.

Carve the rider's hat. Put the finishing touches on the brim just as the cowboy does when he puts his hat on. Give the brim

a curl with the tool. Cut under the left side of the brim at least $\frac{1}{8}$ " inch and also behind the top edge of the right side. The brims are the thinnest carved pieces.

Lastly, use the tip of the knife to carve the mouth and ear—add a small hole in each. Detail the shirt and the left boot with fine V-cuts no more than $\frac{1}{32}$ " deep. Chisel the shirt smooth with the skew so there won't be much sanding. Do not sand until you're completely finished with the carving. Sand residue on the wood quickly dulls tools. Buff the wood smooth with the back of a tool.

Finishing

The finished Rodeo Rider carving is stained a variety of browns, carefully brushed on and rubbed with a rag. Stain the arena sky a soft blue and then wipe it off to show the wood grain. Stain the dust cloud under the horse light gray along the edges. Stain the fence dark brown, carefully brushing sky blue between the rails.

Paint the rider's hat and horse's eye with black acrylic paint. White paint is used for the rider's shirt—rub it while it's wet to make it look dirty—the horse's forehead, nose, eyeball and the cinch around its middle, which has been decorated with two red diamonds. The finished piece was stained on the edges and back then sealed with Deft; a picture hanger is nailed on its back, $1\frac{1}{2}$ " from the top. **PW**



rounding off

From Forest to Final Form



by Joseph A. Vano

Many years ago—more than I care to think about—one of the subjects I was exposed to in grammar school was manual training. That's where the bug bit me, and it's lasted all these many years. At times, the disease was in remission, but it never really went away. It would reoccur at the darndest times. Even while in the service, during WW II and after the shooting stopped, I frequented the post hobby shop and got involved in a number of projects—some are still around today. Sadly, with school, family, job and reserve duty, projects were limited to repair, maintenance, and additions to the house and property. However, after retiring from AT & T in 1981, the bug reemerged in all its fury and I've become an addict. There are those who swear I'm a tool collector and only a woodworker on the side, but that's only jealousy!

One of the first things I did after retiring was take a class with Shop Smith in cabinet making. I bought my first machine in 1950, and I'm on my third one now—I wouldn't be without one. I needed to get back to the basics and find out what was new in woodworking. It was an excellent experience and highlighted areas where I hadn't remained current, like the availability and cost of materials.

I wanted to build a project in oak, didn't have any on hand, so I went out to buy the wood. The price was a big

shock, but the biggest problem was getting it in the thickness I wanted. I had to take something else and have it milled. For me, that was like waving a red flag at a bull. Why couldn't I get what I wanted, when I wanted it and in the size I needed?

As an inveterate do-it-yourselfer, I've always felt that I could learn almost anything with time. So I began looking into sawmills. There is a number of small, so-called one-man mills on the market and I sent for literature and information on several. I attended several trade fairs in the area to see what was available, how it worked and if it would fit my pocket book.

I liked what I saw in band saw mills as opposed to the circular mills, both from a safety standpoint and the ease of setup and operation. Another selling point was the increased yield from the log. Price was dependent on model and how you wanted it equipped. When I started looking in 1983, mills were in the \$5000 to \$10,000 range, but today with all the options and additions they can exceed \$19,000. In a way, they're just like cars—what do you need, what do you want and what can you afford to pay? After much soul searching, I settled on a Wood-Mizer Bandsaw Lumber Mill with a 14 hp engine.

Unlike today, the machine I wanted didn't come with a trailer package, but I added it almost right away. I can take my sawmill anywhere I can take my four-wheel drive pickup truck. My mill is a 1983 model. The technology has seen many improvements in the interim, such as increased power—18 and 24 hp engines—hydraulic controls for log handling and better blade sharpening methods, etc.

Joseph Vano is retired and keeps busy milling lumber for friends with the Woodworkers of Central Ohio.

So I own a band saw lumber mill, now what do I do with it? I'd seen several demonstrations and had asked millions of questions, but nothing prepares you for the first time you solo. I read the manual backwards and forward several times, but now it was time to fish or cut bait. I backed the mill out of the barn and looked for a nice level spot to set it up.

After unhooking it from the truck, it's necessary to level the mill and be sure it's chocked and stable. This is no big deal, but does require close attention and a little muscle to use the leveling jacks on the outrigger legs. They're similar to those used to raise and lower many types of farm equipment and use a bar or rod to jack up each leg.

One important thing to check before setup is the wind. If you set up in the wrong direction you'll be eating sawdust the whole time. Some philosopher once said, "...he who cannot remember the past is condemned to repeat it." Ask me, I only had to do it once! I'd also recommend a safety helmet with an air filtering system, such as the Racal Airstream 3 with hearing protectors.

With the mill set up and level, you can remove the pin securing the head, move the head up slightly to release it, and move it to the other end of the bed with the forward/back traverse motor. You then place the controls in neutral and go around the mill to put the log raising ramps in place. These hook up to the bed of the mill. There are three locations that can be used depending on the length of the logs you'll be cutting. The ramps are inclines used to raise a log from the ground up to the bed of the mill using a hand or electric winch.

With the log in position at the bottom of the ramp and the stops raised on the bed, you pass a cable over, then under the log, and back to the bed of the mill. When the winch is engaged, the log rolls up the incline onto the bed. Take care in positioning the cable to keep the log rolling evenly up the ramp. Sometimes it's necessary to use cant hooks or pry bars to control the log. If the log breaks loose and rolls back down the ramp, you can be seriously injured. As soon as the log is on the bed, place the log-holding safety in place to snug the log to the stops, then secure the safety chain.

Now it's time to closely inspect the log. Look for any sign of foreign materials such as wire, nails, fencing, mud or anything that can damage the blade or cause injury. Although I've never experienced anything more than a broken blade when I cut through a lag bolt hurried in the log, I might add that it's wise to wear safety shoes with hard toes, safety glasses, a hard hat and gloves.

If the log was skidded or dragged into position, it's possible that there's mud present and the log must be debarked on the entry side of the cut. This prevents mud from getting pulled into the kerf and dulling or breaking the blade. Debarking is done with an axe, adze, a bark spud or with a debarking attachment for chain saws which Wood—Mizer sells.

Far left: The remotely controlled winch pulls the log up the ramp and into position on the bed.

Below: The log is clamped against the side dogs and the cam is secured with the safety chain.

Removing the top flitch.

The second cut is $\frac{1}{4}$ —actually $\frac{15}{16}$ " which will plane to $\frac{3}{4}$ ".



If the log has a flared butt, bumps or branch knots, it may be necessary to raise one end or the other to make cuts that parallel the center of the log. On my mill, this is accomplished with a pry bar, the cant hook, or a pole to raise the log and shim it at the desired level. Then refasten the safety chain and you're ready to fire up and start cutting.

Before we start cutting, a few words about the mill and its bandsaw blades are in order. My Wood-Mizer mill will handle

Rotating the log 90° with the cant hook.

Removing another flitch.

The log has been reduced to a cant, now it's time to cut for grade.



logs up to 30" in diameter and 16' 6" long. The blade is 158" long—that's 13' 2". They're 1¼" wide with 7/8" pitch and are either .035" or .042" thick. A blade usually lasts two to four hours before it needs resharpener and/or resetting. I'd guess that blade life is about 20 hours. Unlike the blades for the band saw in your shop, these should be discarded when they brake. An interesting thing about band saw blades is that running them shortens their life. Even if the blade isn't cutting, it causes metal fatigue and weakens the blade. It's wise to stop the blade when it's not cutting. The Wood-Mizer has a built in brake to stop the blade when the clutch is disengaged, but you have release the clutch.

The blades can be sharpened and reset with a blade maintenance package that's similar to a chain saw sharpening grinder with some refinements. The late model mills have hydraulic blade tensioning—it's available as a retrofit kit for older models. Don't forget to adjust the blade guide arm for the correct diameter of log.

The Wood-Mizer has a water drip system that's used to prevent gumming or pitch buildup on the blade that can lead to premature dulling. Turn the water to a slow drip and monitor the blade as cutting progresses. If the blade begins to gum up, adjust the water flow as necessary. The water drips on the blade where it enters the log so some staining may appear, but it's usually not harmful.

Let's get started cutting lumber from logs. Start the engine—there's an electric starter—and raise the head with the up/down motor to the desired height so the first cut is in the skinned portion of the log. Sight down the log and make sure there are no obstructions or clearance problems, and pull down on the clutch handle to engage the saw and start the blade. The motor has a built-in governor that automatically accelerates the engine. Push the travel *lever forward* and the entire head assembly moves into the log to begin cutting.

The traveling speed of the head is variable, so you can adjust the speed depending on the kind of wood you're cutting, the atmospheric conditions and the temperature. My machine has three pulley-belt positions and six positions on the voltage-switch controller so there are 18 different speed settings.

The blade should be allowed to cut at the fastest possible speed to maximize its life. This is a judgment call and listening to the motor and watching the travel will tell you when all's going right. This takes a little time, but you'll develop an ear for it. With the Wood-Mizer, the bandsaw moves into the log with the log fixed in position. (With circular mills, the log moves and the blade is stationary.) The saw head is cantilevered and rides over the log to cut at the desired depth. There's a scale at the operator's position for setting the depth of cut.

The first cut removes the top portion of the log—the flitch—at the thickness set. **When the blade has travelled the length of the log, travel is stopped and the clutch disengaged.** The flitch is removed, the travel switch placed in reverse and the saw is returned to the starting point. For longer logs, there's a handle to speed up the return.

I hope you have good comfortable shoes. As I stated earlier, the saw moves so the operator walks back and forth to stay with the controls. You have to monitor the progress and adjust the clutch, speed of travel, thickness of cut, throat width, water flow, and all the other things that might interfere

with cutting. If you're only cutting one or two logs it's not a big deal, but if you're cutting a couple of thousand board feet a day, you're going to be covering a lot of ground. The newer Wood-Mizers have an optional built-in seat.

After the first cut, the safety chain can be removed and the safety loosened. The cant hook is then used to rotate the log 90° or 180° and the process is repeated for all four flitches. The log is now called a cant and is rectangular or square. Sometimes the diameter of the log dictates more than one cut on a side before it's a cant. The cuts can be whatever thickness desired, but the barked edges still have to be trimmed later. Trimming is a slow operation, but it saves a lot of good wood; especially if it's walnut, cherry, hedge or any other relatively expensive wood. It's usually worth the effort and time.

Once the log is reduced to a cant, the hold down may not be necessary; then you can begin cutting for grade. Pick the best face and cut accordingly. Rotate the cant as it's reduced to give the best lumber.

As I mentioned earlier, there are considerable savings with a band saw lumber mill versus a circular mill—less sawdust. The band saw blade is .035"-.042" with the set adding another .021" for a total of .084" or roughly $\frac{1}{16}$ ". With a circular mill, the blade eats $\frac{3}{8}$ " per cut and leaves a very rough edge. This adds up to five boards with the band saw compared to four on the circular saw—a 20% saving. With expensive woods, this is a significant amount.

Another great feature of the Wood-Mizer Bandsaw Mill is the ability to make thin and unusual cuts. This satisfies my gripe about not being able to buy the thickness of boards I want. I dislike having to buy $\frac{3}{4}$ " wood and have it planed to $\frac{1}{2}$ ", $\frac{3}{8}$ ", $\frac{1}{4}$ ", or whatever. I can make any of these cuts on the Wood-Mizer. Of course your mill has to be properly aligned, and the blade must be sharp and set properly.

A stockbroker friend called one day and asked if I could handle an unusual piece of walnut. He told me a walnut tree on his property had blown down and he wanted to know if the root section could be cut for a coffee table top. I said I thought we could do it if it would fit through the 30" throat on the mill. After a thorough cleaning, we first put a piece of plywood on the mill, then placed the root on top of it. We pruned off roots and irregularities until it cleared the throat of the mill. I then sliced off 2" and 2½" slabs. I was amazed at the figure and color of the slabs. They were irregular in shape, and when finished, they were things of beauty. A chain saw would have left the slabs extremely rough and nearly impossible to finish.

With long logs, sometimes it's necessary to cut off short pieces to get the desired lengths. These usually end up as firewood or at best, lathe turning stock. Occasionally, I mount the shorts vertically or slanted at 45° or more and cut slabs for plaques or nameplates. The more irregular the shape, the better.

Well, that's my story. I don't operate the mill commercially, but I will cut for friends and fellow woodworkers who find it impossible to get small amounts of unusual cuts from commercial mills. I don't blame the commercial mills, after all they're after volume and cutting a small number of logs on demand isn't cost effective. That's not to say the Wood-Mizer isn't commercially viable, it's just not the way I use mine.

There is one other problem when you own one of these mills—where do you put all the cut boards to let them dry? This led me to set up my own kiln. My wife wants to know what's next? All I can offer is to say how delightful it is to look at a finished project and be able to say, "I remember where the tree that produced this wood used to stand." **PW**

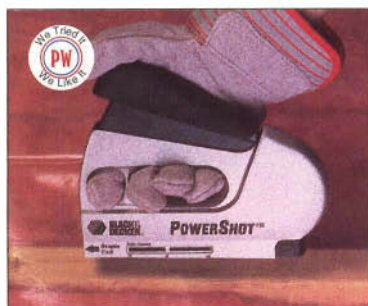
To contact Wood-Mizer for information call (800) 553-0219.

**A 4/4 x 12" x 8' board of black walnut—any takers?
Set-up for cutting unusual log remnants.
How about that figure!**



News and Notes

New products to announce? Send a press release and a color photograph to the Editor, *Popular Woodworking*, 1041 Shary Circle, Concord, CA 94518, and we'll consider them for "News and Notes."



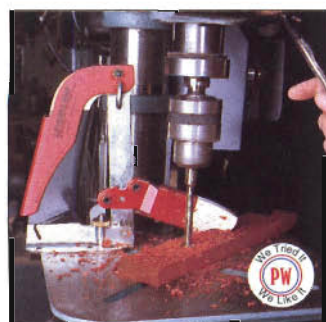
Black & Decker's new PowerShot™ Heavy Duty Staple Gun eliminates kickback and the necessity for two-handed operation. Its "forward action" design puts the driving power directly over the staple for smooth and complete

stapling. It has an ergonomically designed handle that's covered with a soft rubber grip for comfortable and secure one-handed operation. A staple exit indicator shows exactly where staples will be driven, providing greater precision and control. A quick load-staple changer clicks open and slides away for easy loading, and a "staples remaining" window lets users know when it's time to reload. For more information contact: Black & Decker Consumer Service at 1-800-762-6672.



CMT's new Diamond Hone brings the world's hardest substance right to the cutting edge of any planer or jointer knife, without taking the knives off the tool. CMT's hone features two 4" long sharpeners coated with 325- and 600-mesh micro diamonds.

The square sharpening bars are securely mounted in a mahogany body that aligns the sharpening surface perfectly with the knife. Woodworkers can touch up an edge anytime, even in the midst of an operation where changing the set-up is out of the question. The Diamond Hone has an introductory cost of \$24.40 and is available from selected dealers or contact: CMT Tools at 800-531-5559.



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For more information or to order call 1-800-4-CLAMPS.

The Accu-Sharp Grinding Jig converts most vertical wet/dry grinders from a general-purpose tool to a specialized chisel and plane iron sharpener. Constructed of aluminum extrusions, UHMW polyethylene and stainless steel components, this jig makes edge-grinding a completely controlled, precision process. The UHMW slide bar rides in the angle gage slot of the Delta grinder's table with no modification. For other grinders having small tables with no slot, an auxiliary fence table designed specifically for the Accu-Sharp Jig is available. Price of the grinding jig is \$28.95, and the auxiliary table is \$11.95. Contact: Parkwood Products Co., P.O. Box 87, Montvale, NJ 07645.

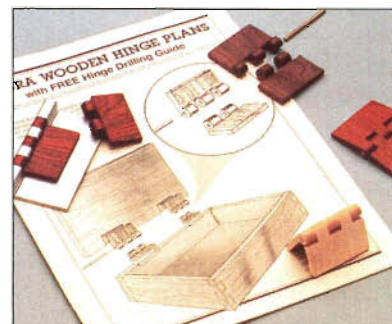


Gold Country Woodworks has just created The Country Collection Woodworking Plans. The Country Collection has step-by-step instructions, detailed illustrations and full size templates that will take you easily from the beginning to the finished product.



Gold Country Woodworks has a guarantee of 100% satisfaction or your money back. For additional information contact: Jack Briscoe, Gold Country Woodworks, 1615 Wimbledon Drive, Auburn, CA 95603. 916-888-6125.

The Woodworkers' Store is now offering ready-made wooden hinges in maple and walnut and a plan that lets woodworkers make their own in any wood species. When laid open, these wooden hinges measure 1 13/16" X 2 1/4". They come in one size only, but offer versatility to the woodworker. The hinges can be trimmed and come undrilled so screw holes can be bored for customized installations. The Woodworker's Store sells the hinges as well as the Incra wooden hinge plan through its catalog and a dozen retail stores. Credit card orders can be placed by calling 800-279-4441. Address Mail orders to: The Woodworker's Store, 21801 Industrial Blvd., Rogers, MN 55374. Shipping and handling charges will apply.





A broad line of fine and specialty woodworking tools from around the world has been introduced by Stanley Tools. The line includes some of Stanley's finest tools from France, England, Poland

and the United States. The line is comprised of over 200 tools in several key categories: Cutting tools, measuring tools, layout tools, striking tools, boring and fastening tools and holding tools. The complete line of Stanley Fine Woodworking and Specialty Tools is illustrated in a full color catalog available free from Stanley Tools. Write to: Advertising Services, Stanley Tools, 600 Myrtle Street, New Britain, CT 06050; or see your local retailer.



Makita is introducing two new pneumatic nailers. The AN451 Roofing Coil Nailer was developed specifically for nailing asphalt and fiberglass shingles in new or reroofing applications and has an operating air pressure of 65-120 PSI. The AF501 Brad Nailer, shown at left, was

designed with maximum power to perform a wide array of finishing applications comfortably. Weighing 2.7 lbs., it's ideal for handling jobs in residential and commercial construction. Both nailers come with a one-year warranty and are available at retail outlets throughout the U.S.

Bostik is now manufacturing unique Teflon® lubricants and coatings for the woodworking industry. Bostik Top-Cote® seals and protects work surfaces and hand tools while Cote® lubricates tool cutting surfaces. Bostik Bearing Lubricant significantly reduces bearing load friction and burn-out of router bit, roller, ball and wheel bearings. Bostik P.A.T. Lubricant cleans, lubricates, prevents rusting and significantly retards the fouling of powder actuated tools. For more information contact: Bostik, Boston Street, Middleton, MA 01949. In the U.S. call 800-726-7845.

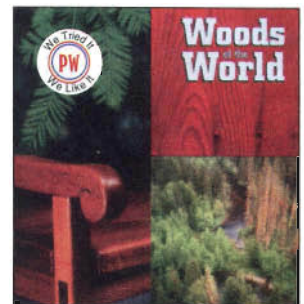


DeWALT Industrial Power Tool Company introduces a completely new line of high performance cordless power tools for professional



and residential construction users which offer more power and longer running times. The first phase of new products, seven driver/drill kits, will be available at retail outlets in early summer 1994. The tools offer a range of battery packs including 9.6, 12.0 and 14.4 Volt models. Ergonomic enhancements to the products include well-balanced compact pistol and mid-handle designs with an anti-slip rubber comfort grip, easy-to-read settings and well-positioned switches. All DeWalt products are backed by a 30-day no-risk guarantee, and a one year warranty with a year free service contract. For more information call 800-433-9258.

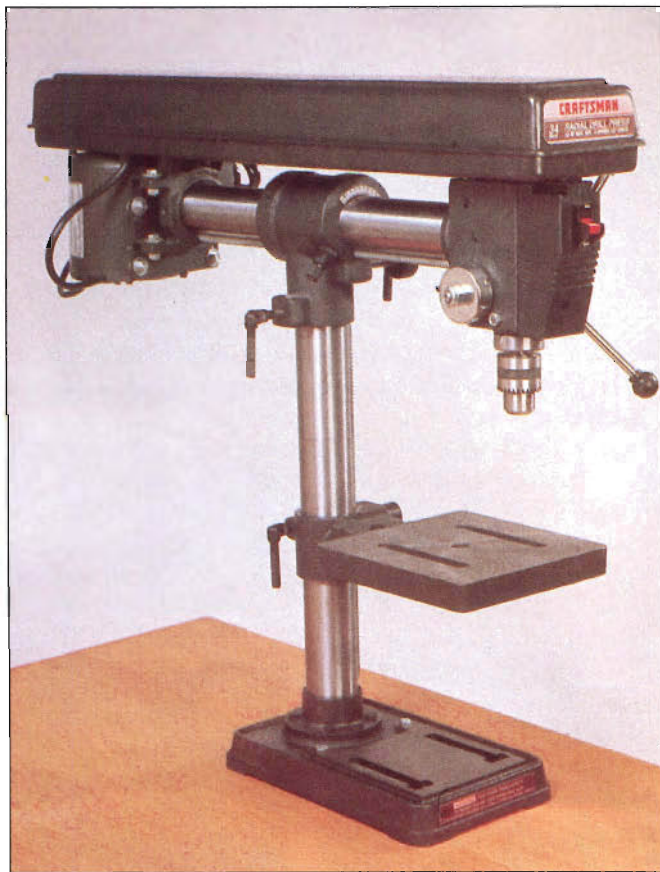
Woods of the World™ contains information on over 800 commercially-viable wood species and wood products. It's designed to give quick access to a great deal of information in a user friendly manner. The database includes general information, physical, mechanical, and wood working properties and over 1,000 color pictures. The program is, to say the least, extensive. It's available for the Mac or IBM. For more information or to order call 802-863-6789.



Bridge City Tool Works, Inc. introduces the DC-40 Dividing Compass. It's both a compass and a divider. Milled from solid brass, it is inset with compound dovetailed Jura wood cheeks. This design makes the tool lighter and less flexible than if it were solid brass, enabling accurate arc work. The radius capacity is from 0" to 20", allowing for circles up to 40" in diameter. The tool comes with a pencil and holds any drawing instrument with a diameter up to 5/16". The DC-40 retails for \$168.00 and is available for a limited time from the Signature Series Edition which is dated, signed and engraved with its serial number. For more information or to place an order call 800-253-3332.



Two New Drill Presses



All woodworkers indicate preferences on lists of important stationary power tools. While preferences are based on the individual's interests and primary workshop chores, the drill press is usually placed near the top. In my mind, it's a number one choice, only second to a sawing machine. Not only will a respectable drill press provide for accurate drilling of small and large holes in materials ranging from wood to steel, it's invaluable for, among other things, many joint-making operations, drum sanding, even some routing and edge-shaping.

Skil HD3580

Skil's new entry in the field proves that designers do think about practical features that go beyond the basic concept. Among them, a swiveling fence that offers setups ordinarily requiring homemade jigs, a rack-and-pinion table height adjustment, and a bit storage case that fits into the tool's base, but that can be used off the machine.

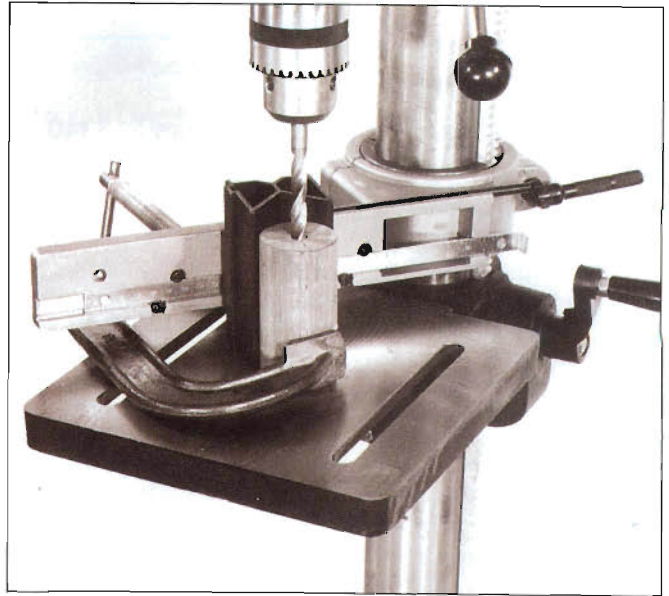
The unit operates with a hefty $\frac{1}{3}$ hp induction motor that drives a $\frac{5}{8}$ " capacity chuck. Cutter rotation is controlled by V-belts and pulleys, in a range of 500 to 3100 rpm. The speeds proved satisfactory when doing chores that encompassed drilling in plastic, steel or drum sanding straight and

curved edges on a wood component. I like the attention given to belt changing. Loosen two knobs that secure the motor position, then use a tension lever to move the motor forward so there is plenty of slack for changing the position. Then, use the tension level to move the motor back where it is secured with the lock knobs. The arrangement makes it pretty difficult to pinch fingers.

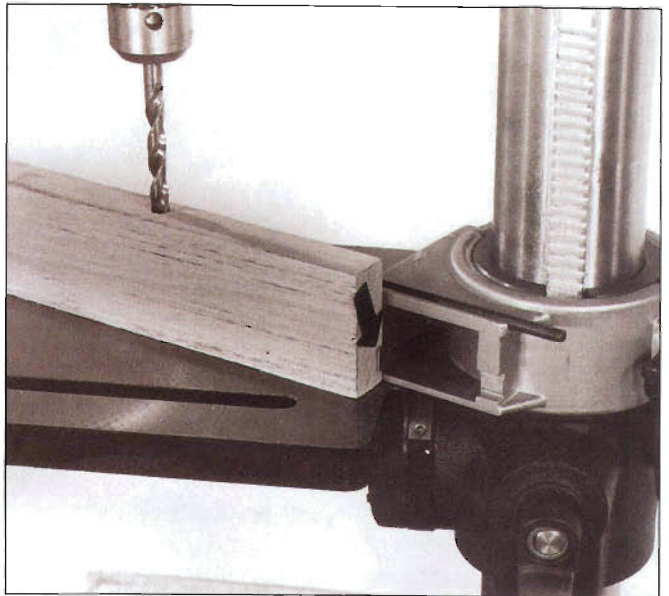
Other characteristics—the maximum length of the spindle stroke is 3"; usable distance between chuck and table is 17". You can pick up about four extra inches if you swing the table aside so the base can be used as a work platform. Another option, common to all bench model machines, is to mount the tool with the head swiveled 90° or 180°—capacity will then be from the chuck to the floor.

The machine has an easy-to-use, calibrated dial that can

R.J. De Cristoforo is a noted woodworking writer and a Contributing Editor to Popular Woodworking. Cris lives with his wife Mary in Los Altos Hills, California.



A V-block is part of the column mounted fence that swings full-circle and adjusts vertically. The sliding stop is calibrated in inches and metric. The lack of a quill lock doesn't impede operations, just crank up the table.



be preset and locked to control quill extension for drilling to a specific depth. You can still use the traditional "workpiece" method—that is, bring the bit down to a mark on the work and, while holding that position, turn the depth adjustment ring so it lines up with "0" and lock it. Thereafter, all holes you drill will be to the same depth. The concept lacks a spindle lock which would enable the spindle to be secured at a specific extension, a feature usable for operations like drum sanding. But the lack is more negligible because the table-height mechanism makes it easy to set the table in relation to the tool rather than doing the reverse.

The table, which is 9 1/8" X 10" and can be tilted to 45° for angular drilling, and the base are slotted, as they should be, to facilitate using clamps for work security. Both components, as is the neck stock, are cast iron, which contributes to overall stability and smooth running.

Finally, this is not a make-do machine. It's substantial, has good power and capacity and performed impressively through common, and some not-so-common chores I subjected it to. The manufacturer's suggested price, which includes the special fence and bit storage case, is \$424.00, but shop around. Skil Corporation, 4300 W. Peterson Avenue, Chicago, IL 60646.



Simple or compound holes are easy, it's a matter of how you position the bit in relation to the work. This unit has enough power to bore larger holes.

Craftsman (Sears) Radial Drill Press 213340

The new Craftsman radial drill press has all the niceties of a conventional machine plus some extras, but it is its "many angles" with practical applications that make it unique.

The head is mounted on a heavy steel tube and can be moved back and forth so that the distance between column and drill bit, unlike standard machines, is variable. With a maximum extension of 17", you can realistically call this tool a 34" drill press! But there's more. The head can swing a full 360° arc, and it can be tilted up to 45° from the vertical in the clockwise direction and 90° counterclockwise. When you provide adequate support for workpieces, the latter posture allows horizontal drilling operations.

Other machines have tilting tables for angular drilling, but it's the flexibility allowed by the infinitely variable positions of the head that make the radial concept so usable for drilling into table tops, chair seats and other project components that require repetitive angular boring.

Unique features are fine, but they alone are not enough to sell a machine. In this case, the product must be a good drill press to begin with, and it is. Power is supplied by a 1/3 hp induction motor that rotates a 0"-1/2" geared chuck. Five speeds ranging from 540 to 3600 rpm are available through V-belt and pulley settings. "Pinchless" belt changing is possible because the hinged motor-mount plate swings toward the column to loosen the belts, then locks in the outward position to provide the correct belt tension.

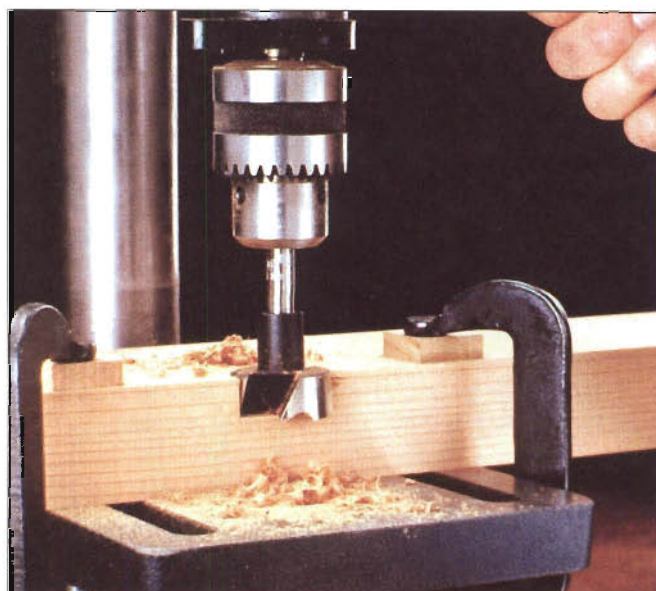
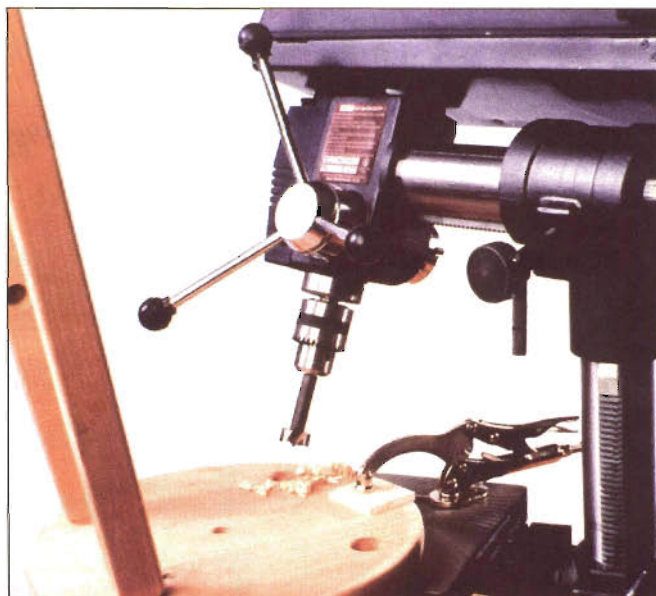
Quill travel is 3 5/16"; capacity between the chuck and the table is 12", but it can be increased to 16 1/2" by swinging the table aside and using the tool's base for work support. The 8 1/2" X 9" cast iron table has a rack and pinion lift mechanism and has a slotted hole at the rear for convenient storage of the chuck key.

Drilling to an exact depth is controlled by a calibrated, built in depth stop. With the table raised so the drill bit just touches the work, the depth stop cylinder is turned until the needed depth on the scale aligns with the pointer on the spindle housing and is then locked. All holes you drill thereafter will be to the same depth.

The radial drill press doesn't have a quill lock like some other machines, but, here too, the lack becomes less significant with the rack and pinion arrangement—it's so easy to raise the table.

Because the unusual capacity of this tool allows working on large, maybe cumbersome components, it's a good idea to provide for extra work support by equipping it with an auxiliary table. One is available as an extra-cost accessory, but you can easily make your own. A word of caution: with the large capacity of this tool, bolt it securely to a firm, stable, broad surface. You don't want a tilt possibility when you do a heavy drilling operation with the arm fully extended.

The price of the tool is under \$300.00 and you might be able to view it at a local Sears retail store. Sears, Roebuck and Co., 3333 Beverly Road, Hoffman Estates, IL 60179.



The Woodcarvers of Songimvelo

by Carolee Boyles-Sprenkel

The mountains of Songimvelo are as ancient, as worn and weathered, as an old woodcarver's hands. They rise above the South African veld, tier after tier of yellow-green hills studded with aloe and thorn trees.

Among these mountains in the Kangwane homeland live the native African Swazi, poorly educated, mostly illiterate, and speaking little English. Despite the lack of what we consider civilization, or perhaps because of it, using only a few simple hand tools the carvers of Songimvelo create a wide array of lush, sensuous sculptures.

On our trip into the mountains, I am skeptical of what we will find. In the towns we pass, the most elaborate houses are simple squares of mud-plastered walls. I can not tell whether the underlying structures are made of cement blocks, clay bricks, or just built-up earth. The roofs are sheets of tin held down with rocks. No plumbing or electricity is in evidence. How can this grinding poverty produce anything of artistic value?

At our first stop, however, I am forced to re-examine my American prejudices. On a wood table in front of sev-



eral small huts, an array of wooden and soapstone animals are arranged in a neat row. My companions and I squabble good-naturedly among ourselves about who will purchase which. I pay 25 Rand for the impala I select, the equivalent of about \$8.50 US.

A white pickup truck—bakkie in South Africa—pulls up. In it are buyers from Johannesburg. Originally from northern Namibia along the border of Angola, they tell us, they now run an export company. They tell me they ship carvings from Songimvelo, Zulu land, and Malawi, to America, Italy and Israel.

I ask one of them what kind of wood the carvers here use most often, and he tells me black wattle.

"In other places they use teak and ironwood," he says. "Ironwood is a

blackish wood. If you polish it or put oil on it, it gets very dark. Teak is more to this type of color, lighter. I always tell the people, 'You must look for the most color in the piece of wood, in one sculpture, and you must put all of that in.' I prefer the teak."

He points to a pile of nondescript limbs, branches and stumps lying to one side. I have paid little attention to that pile until now, thinking it was firewood—my American prejudices are showing again.

"They use the dead trees, seasoned wood," he says.

With the arrival of the exporters, the door to one of the little buildings opens. One of the carvers starts bringing out a fantastic array of sculptures, everything from long-necked giraffes to fanciful faces captured in tree branches.





Inside, we find more small animals carved in both wood and soapstone.

While the Namibians are examining these treasures, I wander over to where a young man is working. Speaking through an interpreter, I ask his name and how long he's been carving. He says his name is Johann Nkompane. He turns out to be an apprentice; he's been working for only three months. An old man was teaching him, he says, but the old man has moved to another area.

Johann says he is working on a meerkat, a small predator. The interpreter is unable to understand what kind of wood the animal is made from. We thank Johann and move on.

Under a small grove of trees, another carver is making chips fly off a limb between his knees. The interpreter

asks how he begins a project. After a lengthy discussion in Swazi, the interpreter says, "He cuts it green and shapes it a little and lets it dry."

I ask for this carver's name also, and how he chooses what to carve. Another lengthy discussion ensues while the chips fly.

"His name is Mandla Shongwe. What he carves depends on what the shape of the wood looks like," the interpreter says. "The wood tells him."

Mandla says he works with only one kind of wood. He calls it "rabbit-ear." The interpreter is unable to determine any other name for it.

I notice that on many of the carvings, the hooves or horns are dark while the rest of the wood is light.

"How do you do that?" I ask through the interpreter.

"In the fire," Mandla replies in heavily accented English, clearly amused that this lady from America doesn't know.

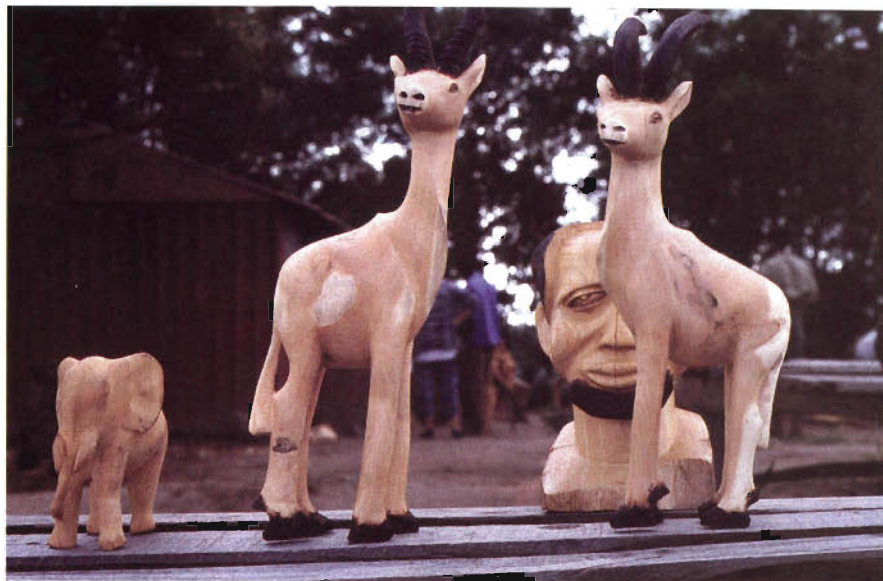
"How does the wood tell you what's in it? Do you see the animal?" I ask.

"Yes, sometimes," he replies. "I sit and look at it, and it tells me something. But sometimes it comes different."

He holds up a long, slim branch.

"Look at this one. This is a giraffe. But you have to force it. The head is OK, but the body is not right. There is supposed to be a branch here so that the body will be a bit longer." He points to where the giraffe's haunches should be. "So the wood just tells what you can do."

While we are talking, the importers are loading their bakkie. Giraffes, old men, a stump covered with faces all dis-



appear into the back. My companions call me, and I excuse myself—we have other stops to make today. I wonder if Johann and Mandela have any concept of how far their carvings will travel in the next few weeks, before they find a home in the corner of someone's living room in Israel, Italy or America.

In the end, I take away the impala and some small soapstone animals, including an exquisitely detailed bush pig. I hold the carved impala in my lap as we drive away. I already know where I will put it in my office. Every time I see it there it will remind me, will call me back, to the hills of Songimvelo. **PW**

***Carolee Boyles-Sprenkel** is a regular visitor to the Republic of South Africa and writes about hunting and guns for Florida Wildlife, Florida Game & Fish, Florida Sportsman, Women & Guns, Rifle & Shotgun Sport Shooting and Shooting Industry.*

TOURS AVAILABLE

If you're interested in traveling to South Africa and seeing the wood-carvers for yourself, tours of Songimvelo and the Kangwane area are available. Now that sanctions have been lifted and free elections held, travel to South Africa is simple. South African Airways flies once a week between Miami and Johannesburg, and offers gourmet meals and fine South African wines during the 15-hour crossing.

For information about tours of Songimvelo, or about importing wood and stone carvings, contact B & B Safaris, P.O. Box 808, Canon City, CO 81215.

Tamarack

In the search for more efficient uses of our forests, tamarack is an under-utilized tree species that seems to have a lot of untapped potential. It's an inexpensive softwood worth considering for both exterior and interior uses.

General Description

Tamarack (*larix laricina*) is also commonly called hackmatack, particularly in the far northeast, where it is a native. It's also known as eastern larch, American larch, Alaskan larch, hack and kneewood. Stick with either tamarack or hackmatack at the lumber yard and you're likely to get the wood discussed here.

There are also a few other native larches in North America. For the most part, they are indigenous to the Rocky Mountain states and the Far West and do not figure prominently in the production of lumber.

Tamarack grows primarily in states along the Canadian border east of the Great Plains to New England, with some of the biggest pure stands in the Great Lakes area. It is also readily available in all the southeastern Canadian provinces from Ontario to the Maritimes, and even stretches westward across north-central Canada and into Alaska.

The tree tends to favor peat bogs and generally swampy areas, although farther north it thrives in uplands and better-drained soils. It usually reaches a height of 40 to 60 feet, although specimens up to 100 feet occasionally have been located. The trunk is long and straight, with branching usually beginning well above the ground. But the crown often looks sparse, particularly in

the winter after the tree drops its needles. The needles turn bright yellow before dropping.

The wood of a tamarack is reminiscent of eastern white pine (PW #61) and eastern spruce (PW #68), with some important differences. Like its softwood brethren, tamarack is light in weight, moderately hard and moderately strong. It's slightly tougher than eastern white pine and spruce, but not by much. It does, however, have a much more pronounced grain pattern to it. This is in addition to the usual knots you get in softwoods. The heartwood is greenish-brown when first cut, becoming a medium yellow-brown when exposed to sunlight. The sapwood, which usually makes up about 20 percent of the sawn lumber, is lighter in color and grain pattern.

An important feature of this softwood is its ability to resist rot. It is on a par with new growth cypress (PW #74) which is a slight improvement over white pine and a marked improvement over spruce. It is not quite as rot-resistant as white cedar (PW #65), but that hasn't stopped boat carpenters from using it as a planking material. That's probably because it also has very good bending characteristics. It's easiest to bend when green and then steamed. But even kiln-dried tamarack will bend with a minimum amount of breakage when steamed.

Taramack is moderately stable when dried slightly better than eastern white pine and much better than eastern spruce. Nevertheless, its common uses have been confined

to general construction applications such as studs, railroad ties, fence posts, pallets, rough crates, ship's knees and tanks. Farmers have been know to use it in rough barn furniture like feed troughs, milking stands, watering troughs and the like. But there's no reason it couldn't be used in lawn furniture, outdoor ornaments, decks, picnic tables, exterior trim and so forth.

Working Properties

As with many other softwoods, tamarack is generally a pleasure to work. It goes through the planer with few complaints. There's occasional chip-out where the grain reverses near a knot at the edge of a plank. Otherwise, you can take off up to one-quarter of an inch in preliminary passes, one-eighth in the finishing passes. Hand planing is just as easy.

Good planing usually ends in quick and easy sanding of tamarack. With the wood is a little harder than pine or spruce, sanding dips are much less likely. Cross cutting, ripping, routing, shaping and boring are also more problem-free than pine and

Ken Textor works wood and writes about it in Arrowsic, Maine.

spruce, again due to the wood's improved hardness.

Putting tamarack on the lathe, however, is a problem. Chips come off in a lumpy fashion and knots can cause gouges. Even if you use knot-free lumber, the resulting surface requires a lot of time sanding to get it presentable. Sanding operations, as well as

cutting and shaping, produce little dust and no marked allergic reactions. Indeed, tamarack has virtually no smell, just a faint pine/spruce odor when slicing through knots or sap pockets.

Tamarack holds fastenings moderately well, much like pine and cypress. It is also much better than spruce at resisting splitting. Without first drilling pilot holes, I was able to drive #8 dry-wall screws into the ends of boards without any splitting. For bigger screws, or nails bigger than 10-penny, you should probably drill a pilot hole. All gluing procedures were without problems.

Finishing

The traditional finish on tamarack is no finish at all. After all, studs, crates, railroad ties and watering troughs are hardly items to fuss over. Nevertheless, if you want to finish a tamarack project, paint or solid stain is probably the best route to go. The wood is too soft for varnish or shellac. A hard whack on a varnished piece of tamarack is likely to crack the finished surface and allow all sorts of staining to begin.

Paints and solid stains should be applied to tamarack with some care. Avoid painting boards with pronounced grain patterns such as those you normally find in flat-sawn lumber.

Quarter sawn lumber would yield the best results. The surface of quarter sawn wood presents a smaller grain surface. Smaller grain surfaces result in better adhesion.

Between the application of coats of paint or solid stain, tamarack needs little sanding. The surface tends to stay smooth and solvents do not raise the grain. Water-based coatings will raise the grain somewhat, requiring sanding between coats with something like 220-grit sandpaper.

Availability

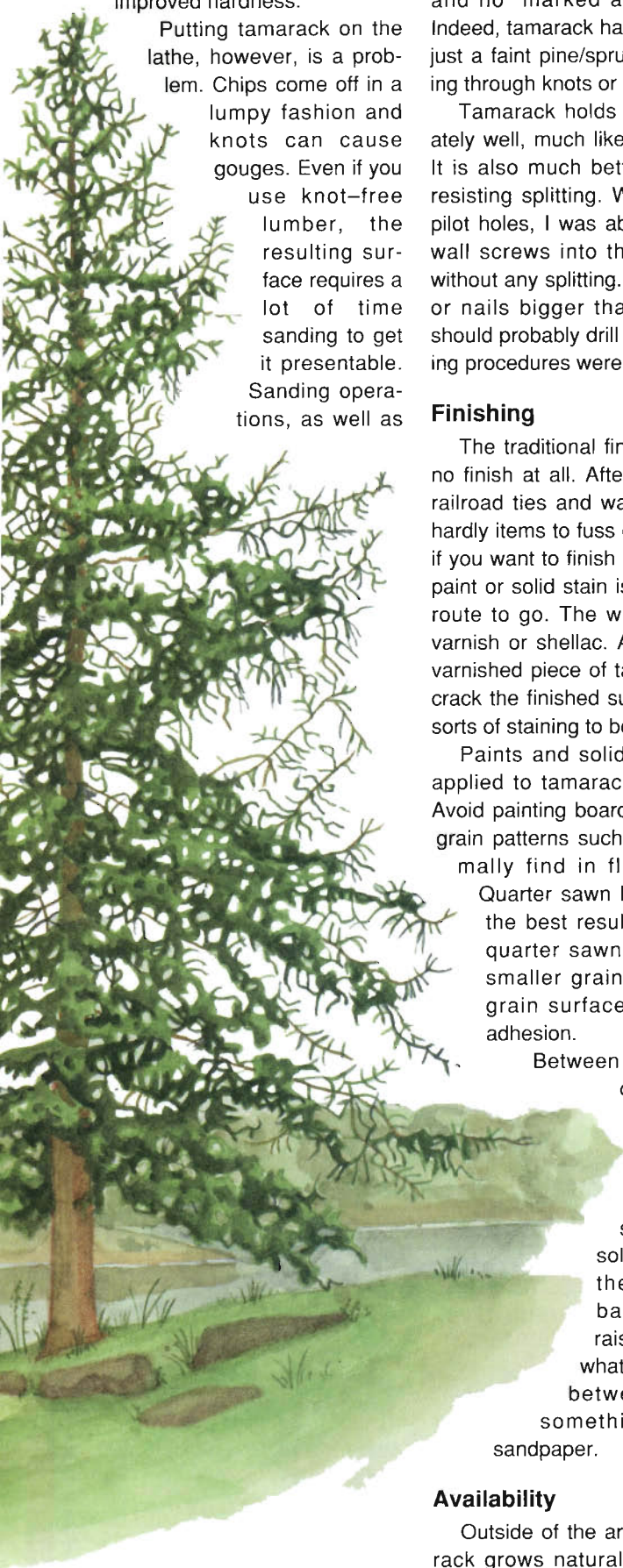
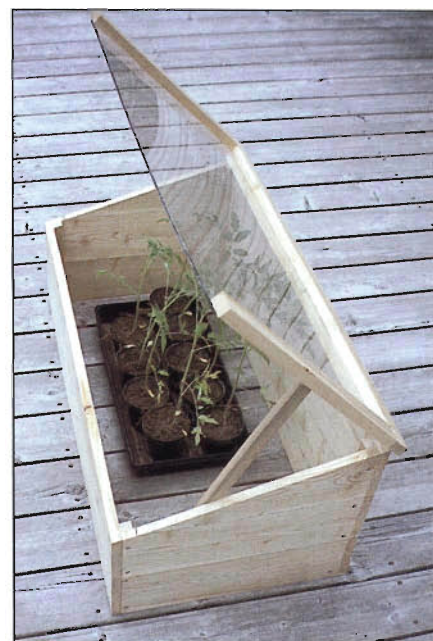
Outside of the areas in which tamarack grows naturally, it is not widely available. Even in those native areas, it

is far from a common wood in lumber yards. Still, the price is low where it is available. The price ranges from \$1.00 to \$2.50 a board foot.

Dimensional stock can usually be obtained with some advance notice. Sizes up to 6 X 6 should be easy to obtain, with a premium on larger sizes. Clear stock of all types is fairly easy to get. Small solid knots are not generally considered a blemish if they are widely scattered throughout the plank. The more knots, the larger they are and the more oblique they are to the surface of the board. With lumber like this, the price should be on the low side.

There are no sources of tamarack plywood or veneer. There are several lumber yards that handle the traditional specialty item—tamarack ship's knees. These are live-edged slabs cut from the stump of the tree where it enters the ground. The tree's growth pattern often makes a 90° turn at this point on the trunk. Thus tamarack knees are still prized in modern wooden boatbuilding for their ability to bridge a 90° turn (usually where the deck meets the hull) without sacrificing the wood's strength or integrity.

So whether you're building a boat or not, tamarack is a wood that's worth trying. Its beauty may not have launched a thousand ships, but its woodworking attributes made it worth putting in all those old-time vessels and even in new home woodworking projects today. **PW**



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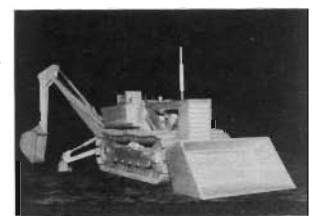
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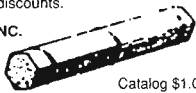
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CLASSIFIED INFORMATION:

Classified Rate: \$3.50 per word; 15-word minimum. **One-Inch Marketplace:** \$275 per issue, \$250 X 3, \$225 X 6. Payment must accompany all ads (not commissionable). Deadline for Issue #81 (October/November 1994) is July 30, 1994. **Popular Woodworking**, Dept. Class., 1041 Shary Circle, Concord, CA 94518. Tel. (510) 671-9852.

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Calendar

If your group is having an event you would like other woodworkers to hear about, please send us all pertinent information at least four months before the opening date. We will publish it for you here in our Calendar section free of charge.

California

Decoy and Wildfowl Carver's Association: (10/7-9/94) The 1994 Wildlife Art Show and Wildfowl Carving Competition at the Doubletree Hotel, Orange, CA.

Contact: Lloyd MacBride, PO Box 8215, Hemet, CA 92545, Tel. 909-845-2237.

Building the Norwegian Sailing Pram: (10/10-15/94) With Simon Watts the emphasis is on learning to use hand tools with speed and accuracy.

Contact: National Maritime Museum Association, Building 275, Crissy Field, San Francisco, CA 94129, Tel. 415-929-0202.

Connecticut

Open House/Woodworker's Day: (9/17/94) Antique tools, manufacturers' reps, woodworking demonstrations, sale items, furniture makers, door prizes and free refreshments.

Contact: Harris Enterprises Corp., 80 Colonial Rd., Manchester, CT 06040, Tel. 203-649-4663.

Kansas

International Wood Collectors Society Annual Meeting: (8/7-11/94) Wood and woodcraft auctions, woodworking demonstrations, woodcraft displays, wood sample sales and swap.

Contact: Allan Ingle, 217 N. W. 35th St., Topeka, KS 66617.

Massachusetts

Woodworking Workshops: (4/4-8/10/94) One Cottage Street School of Fine Woodworking and UMASS Division of Continuing Education are offering a large variety of woodworking classes, Easthampton, MA.

Contact: Michael Coffey, One Cottage Street School of Fine Woodworking, One Cottage Street, Easthampton, MA 01027, Tel. 413-527-8480.

Eastern States Craft Festival: (10/22-23/94) Eastern States Exposition, West Springfield, MA.

Contact: United Crafts Enterprises, Ltd., Box 326, Masonville, New York, 13804 Tel. Stan Rabbiner 607-265-3230 or Donald Allen 607-748-5224.

Worcester Center for Crafts: (11/25-27/94) 12th Annual Festival of Crafts.

Contact: The Registrar, 25 Sagmore Road, Worcester, MA 01605, Tel. 508-753-8183.

Tool Making for Woodworkers: The first three weekends of each month.

Contact: Ray Larsen, Genuine Forgery, Inc., 1126 Broadway, Hanover, MA 02339, Tel. 617-826-8931.

Michigan

Tillers International: (10/3-8/94) Classes in Timber Framing and Raising Timber-frame Structures.

Contact: Richard Roosenburg, Tillers Intl., 5239 S. 24th St., Kalamazoo, MI 49002, Tel. 616-344-3233.

Minnesota

Classes/Workshops/Demo's: (year round) Information, manuals and hands-on. Instruction for beginners to advanced, hobbyist to business. Minneapolis/St. Paul area.

Contact: Wild Earth Woodworking, 401 Hunter Hill Road, #3, Hudson, WI 54016. Tel. 715-386-3186.

Montana

Good Wood Show V: (9/30-10/2/94) Competition: beginner, novice and open; Prizes: cash and ribbons.

Contact: Beth Husband, 2919 Lynn Ave., Billings, MT 59102, Tel. 406-656-2051.

New Jersey

Peters Valley Craft Center: (6/3-8/26/94) Courses include topics such as, Basic Woodworking, Finishing, Upholstery, Furniture Design and many more.

Contact: Peters Valley Craft Center, 19 Kuhn Rd., Layton, NJ 07851, Tel. 201-948-5200.

Ohio

Conover Workshops: (10/94) Handplane, finishing, bowl turning, English clock, machine joinery, routers, chip carving, woodturning tools and more.

Contact: Conover Workshops, 18125 Madison Rd., P.O. Box 679, Parkman, OH 44080, Tel. 216-548-3491.

Pennsylvania

Pennsylvania Crafts Festival: (8/10-11/94) Grange Fairgrounds, Wrightstown, Bucks County, PA.

Contact: United Crafts Enterprises, Ltd., Box 326, Masonville, New York, 13804, Tel. Stan Rabbiner 607-265-3230 or Donald Allen 607-748-5224.

Texas

Rio Grande Valley Woodcarvers Show: (1/20-21/95) Civic Center, McAllen, Texas.

Contact: Dorothy Chapapas, RR 2, Box 150, McAllen, TX 78504, Tel. 210-581-2448.

Tennessee

"Woodturning: A Tribute to the Osolniks": (10/20-22/94) Arrowmont School of the Arts and Crafts.

Contact: Sandra Blain, Director, Arrowmont School, PO Box 567, Gatlinburg, TN 37738, Tel. 615-436-5860.

Virginia

Sugarloaf Mountain Works: (9/9-11/94) Featuring 335 professional artists and craftspeople. Prince William County, Manassas, VA.

Contact: Sugarloaf Mountain Works, Inc., 200 Orchard Ridge Drive, Gaithersburg, MD 20878, Tel. 301-990-1400.

Wisconsin

International Lathe-turned Objects: (11/5/94-1/8/95) Featuring sixty-seven objects by fifty-three artists from seven countries selected from the Challenge V competition sponsored by the Wood Turning Center of Philadelphia.

Contact: Marcia M. Theel, Public Relations Coordinator, Leigh Yawkey Woodson Art Museum, 700 N. 12th St., Wausau, WI 54403, Tel. 715-845-7010.

Canada

Markham Wood Show: (9/9-11/94) Markham Fairgrounds, Mc Cowan Road, 7km North on Hwy. 7, R.R. #2, Markham, Ontario, CANADA, L3P 3J3 (Near Toronto).

North Bay Wood Show: (9/19-21/94) Memorial Gardens, Chippewa St. between Cassells and Fisher St., North Bay, Ontario, CANADA.

Edmonton Wood Show: (9/30-10/2/94) Northlands Agricom (Hall A), 118th Ave. between 82nd and 66th Streets, Edmonton, Alberta, CANADA.

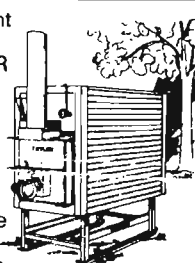
Canada, Contact: Cydeman Productions, 136 Thames St., Chatham, Ontario, CANADA, N7L 2Y8, Tel. 519-351-8344.

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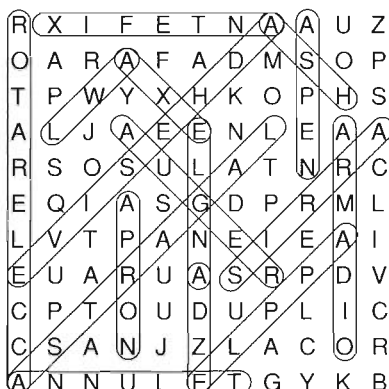
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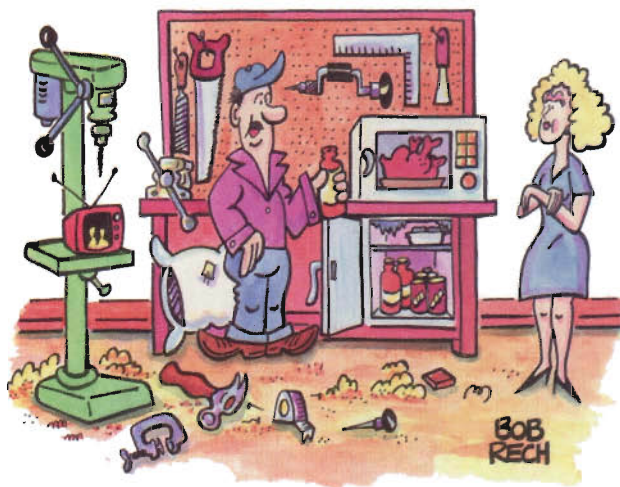
Wood-Mizer Products, Inc.
8180 West 10th Street Dept. DF21
Indianapolis, IN 46214-2400

Popular Woodworking's**CAPTION THE CARTOON**Contest sponsored by **SKIL**

Submit your caption(s) for this cartoon on a **postcard** to *Popular Woodworking*, Cartoon Caption #8, 1041 Shary Circle, Concord, CA 94518. The deadline for entries is October 1, 1994. Entries will be judged by the woodworking staff. A winner and two runners up will be chosen.



The two runners up will receive a one year subscription to *Popular Woodworking*. The winner receives the new Skil 8" Drill Press, model 3380. Features include: 1/4 HP induction motor, 5 speeds (620-3100 rpm), adjustable depth stop, 1/2" chuck with 2" spindle travel and 7" chuck to table clearance—10" to the base. There's a conveniently located chuck key holder and a drill bit storage compartment for 20 bits (1/64"—1/2"). The warranty is for 2 years.



"So that's what happens when
you get old and run out of sap?"

AND THE WINNER IS...

The winner of our "Caption The Cartoon Contest #6" in the May, 1994 issue, and recipient of the DeWalt DW682K Plate Joiner shown there is:

William F. Baird, from Waynesburg, Pennsylvania

The runners up receive a one year subscription to *Popular Woodworking*.

Matt Kintzele, from Cody, Wyoming

"It's got three settings—rough, fine and extrude!"

Thomas Breyette, from Morrisonville, New York

"Not bad Mr. 'Who-Needs-Instructions!'"

“It might come in handy some day.”

—The 25,000-Piece Collection of Scrap Lumber.

There's a monster lurking in my basement—a monster whose ranks increase every time there's a buzz of the table saw, a WHIRRR of the belt sander or an irresistible garage sale within a ten-mile radius. The “monster” is our 25,000-piece collection of scrap lumber that Hubby is saving for the always hallowed reason that, “It might come in handy some day.”

To be fair, scraps of wood are ostensibly a normal by-product of active, productive and—I might add—greatly appreciated woodworking activities. (What would I do without my cedar planters or my walnut jewelry case?) But is it really necessary, even in this modern age of recycling, to save each and every last solitary castoff? I began to have visions of becoming homeless simply because the home we did have was being filled with every bit of scrap lumber in a five-county area. Just what is it that inspires the normally levelheaded woodcrafter to save, save, save?

Diane C. Arkins writes home-related humor essays for the HOME-LIFE section of the Chicago Sun Times. She is a regular contributor of humor/human interest opinion essays to the editorial pages of the Chicago Sun Times, Detroit News and USA Today. She has been published in a wide variety of major home and women's magazines.

The woodworker at my house resisted any suggestions that we cull a few pieces of pine, or reorganize the oak pile. It was then that I started to wonder if there wasn't something more than mere frugal practicality behind my resident woodworker's tendency to save. I began to suspect that the reason Hubby was filling every nook, cranny, shelf, cupboard and drawer with wood, wood and more wood was that the leftovers represented a sentimental walk down the woodworker's memory lane.

“Those oak rails are leftover from the cradle I made for Stacy (our young niece),” he protested. “And there's cedar from the deck...and I'm sure I'll be able to use those scraps of maple from the cutting board for something or other.”

“That's great, dear,” I concurred, “but you practically need a road map to navigate the basement. What about all that regular old wood?”

“Honey, I'm sure it will all come in handy some day...”

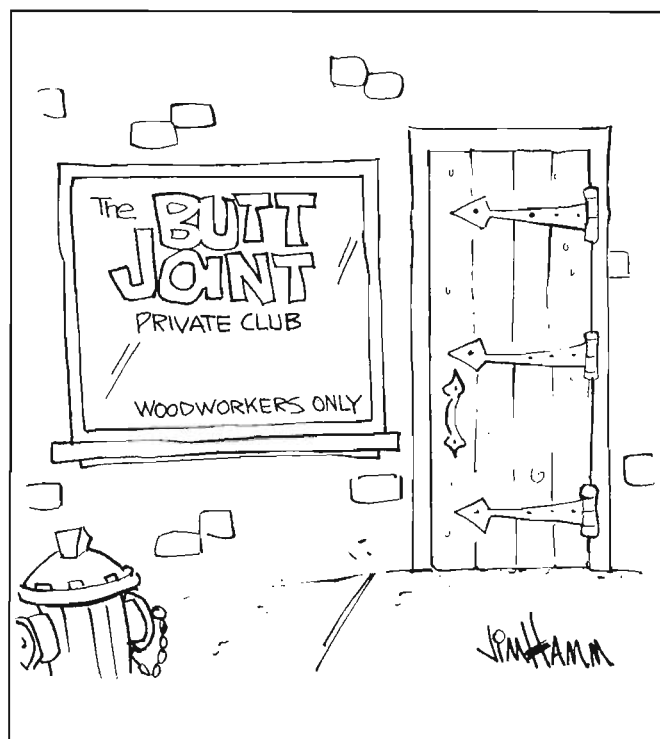
Was it possible that the spare lumber was indeed lying in wait after all, just like the cavalry, waiting to save the day? All 25,000 pieces?

And then I began to take a look at how our record-sized collection had been called into active duty all around me. There was the doghouse crafted with plywood leftover from building the outdoor storage shed. The scraps that Hubby had fashioned into a spinning squirrel feeder that kept the rascally critters away from our bird feeders and amused us when they dined. The bird houses. The tiny replacement crib my woodworker lovingly crafted for my nativity scene. Why, even the sawdust had come in handy when we decorated the manger!

To be honest, though, I didn't recognize the true value of the collection until the day Mother Nature arranged for my lilies to wilt instead of lilt after a windy midsummer storm. The sadly-bent plants needed HELP!—and fast.

It was then that inspiration struck. I rushed downstairs to madly search the “collection” for a supply of first class plant supports (a.k.a. three-foot bits of “useless” scrap lumber cut from the edge of a plywood something-or-other), which it graciously and speedily supplied. Hooray for the “collection” (now down to just 24,989 pieces) - and for my practical and crafty resident woodworker who had the foresight to save!

So the next time I need a plant stake, a door stop, or some kindling wood for the fire, I know where the cavalry resides. Everyone should be so lucky to have a 24,989-piece collection like ours. It does indeed come in handy...just about every single day. **PW**



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